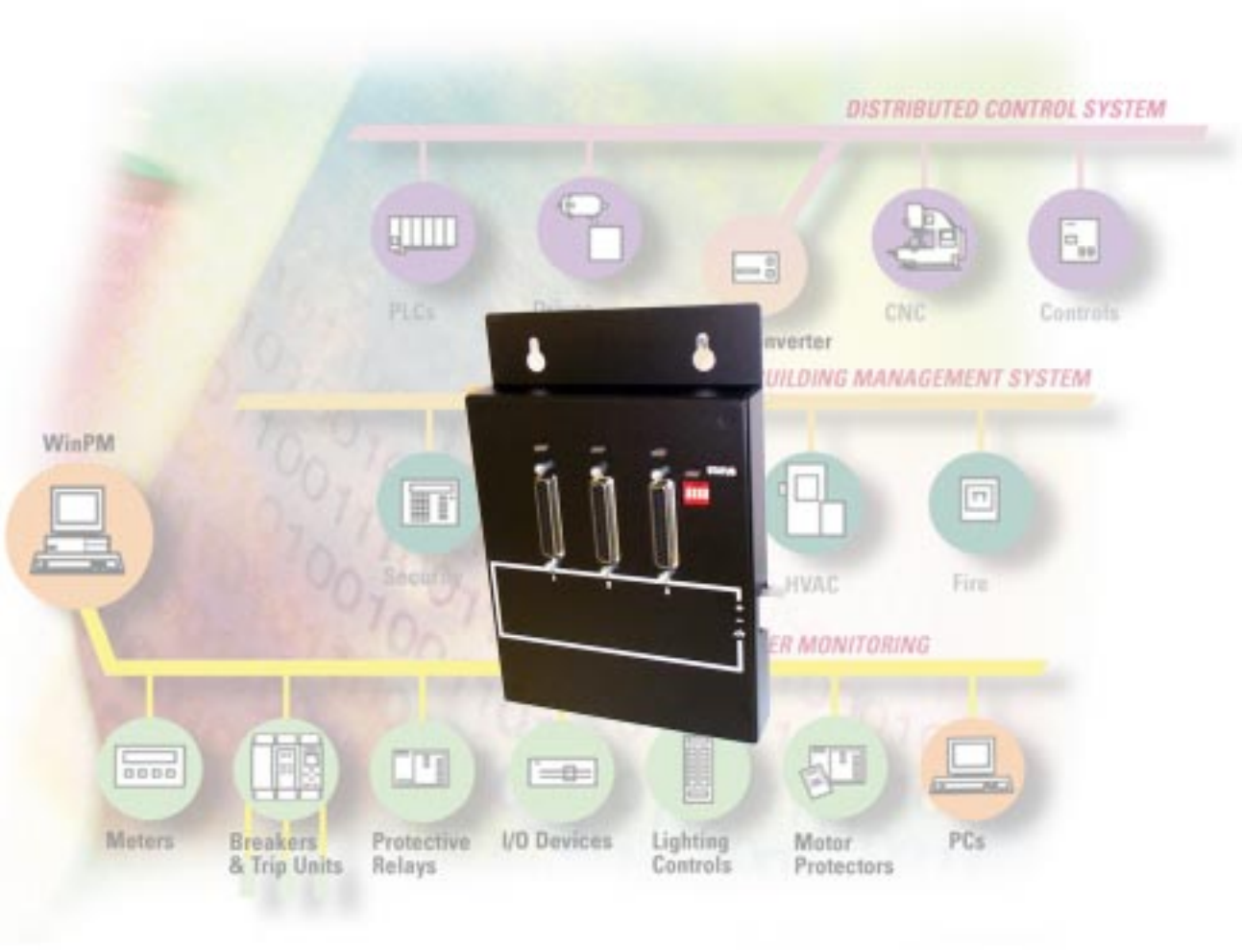
SIEMENS

DTU3005-B

Intelligent Data Transfer Device for Connection to PLCs and Modbus Networks
Operator's Manual



⚠ DANGER

Hazardous voltages and high-speed moving parts in electrical devices communicating with WinPM.

Can cause death, serious injury or property damage.

See safety instruction contained herein. **Restrict use to qualified personnel.**

The use of unauthorized parts in the repair of the equipment or tampering by unqualified personnel will result in dangerous conditions that can cause death, serious injury or property damage.

IMPORTANT

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenence of the equipment purchased. Siemens reserves the right to make changes at any time without notice or obligations. Should a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material or both, the latter shall take precedence.

QUALIFIED PERSONNEL

For the purposes of this manual and product labels, "qualified personnel" is one who is familiar with the installation, construction, or operation of the equipment and the hazards involved. In addition, s/he has the following qualifications:

(a) **is trained and authorized** to energize, de-energize, clear, ground, and tag circuits and equipment in accordance with established safety practices.

(b) **is trained** in the proper care and use of protective gear equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety procedures

(c) **is trained** in rendering first aid.

SUMMARY

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenence. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens Energy & Automation, Inc. sales office.
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Siemens maintains control of all specifications for the SEAbus and SEAbus Plus protocols. A modification to a protocol for any type of device must be approved by Siemens Energy & Automation, Inc. to guarantee compatibility. Any changes made must be backward compatible so that existing products can coexist on the communications bus without having to support the newer features of the protocol

Siemens continuously strives to ensure backward compatibility, reliability, and easy implementation of both protocols to meet current market communications requirements. Siemens therefore reserves the right to make improvements including changes to specifications at any time without notice or obligation.

1 Introduction

1.1 Product Overview

The Panel-Tec DTU3005 is an intelligent, multiple-function data transfer unit that enables communications between Siemens communicating power meters, trip units, and protective relays, and PLCs or Modbus networks. The device is designed for the harsh industrial environment and is suited for use in switchgear. The device is shown below in **Figure 1.1**. The device is powered from an external power supply. Three ports allow for connection to the Siemens ACCESS devices and selected protective relays, a PLC or a Modbus RTU or ASCII master system, and a passthrough, which allows direct communications with port 1 or port 2 from port 3. Status lights indicate proper operation, and DIP switches allow access to programming and diagnostic modes.

The DTU3005 device supports a wide variety of PLCs and Siemens ACCESS devices. **Appendix A** lists the PLCs and protocols supported by the DTU3005. **Appendix B** lists the supported Siemens ACCESS devices and protective relays.

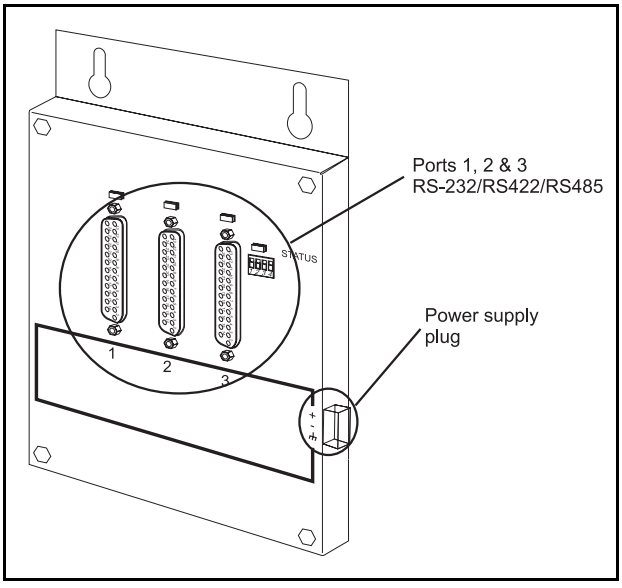


Figure 1.1 Panel-Tec DTU3005 View Showing 3 Ports and Power Supply

1.2 Software Overview

The DTU3005 Editor software is a MS-DOS based program for configuring the DTU3005 device. It provides for uploading and downloading configurations via the computer's serial port. You can edit and save configurations in project files on your computer's hard drive. **Chapters 2** through **8** discuss installing and using the editor software to configure your DTU3005 device.

1.3 Features

Device Features:

- Compact size (8" x 6" x 1")
- **Port 1 and Port 3 Features**
  - Transfer data directly to one of 25 PLCs supported
  - Baud rates up to 187,500
  - Addressable Modbus RTU slave capability
  - (Port 3) Passthrough Port for connection to WinPM
- **Port 2 Features**
  - Twelve Siemens ACCESS devices supported
  - Ten Siemens protective relays supported

Editor Software Features:

- MS-DOS based (also runs under Microsoft Windows)
- Menu driven
- Mouse supported (but not required)

1.4 Applications

The following are possible hardware configurations using the DTU3005 to connect to Siemens ACCESS devices.

1.4.1 PLC to SEAbus

The basic configuration is a PLC attached to port 1 of the DTU3005, and the Siemens ACCESS devices attached to port 2. This is shown below in **Figure 1.2**. Port 3 can be configured as a passthrough to the SEAbus devices. This allows a personal computer running Siemens WinPM™ or other supervisory software to connect directly to the SEAbus devices at the same time as the PLC. This is shown in **Figure 1.3**. An additional DTU3005 device can be attached to port 3. Up to 32 DTU3005 devices can be daisy chained together, each connected to up to 32 Siemens devices. This is shown in **Figure 1.4**.

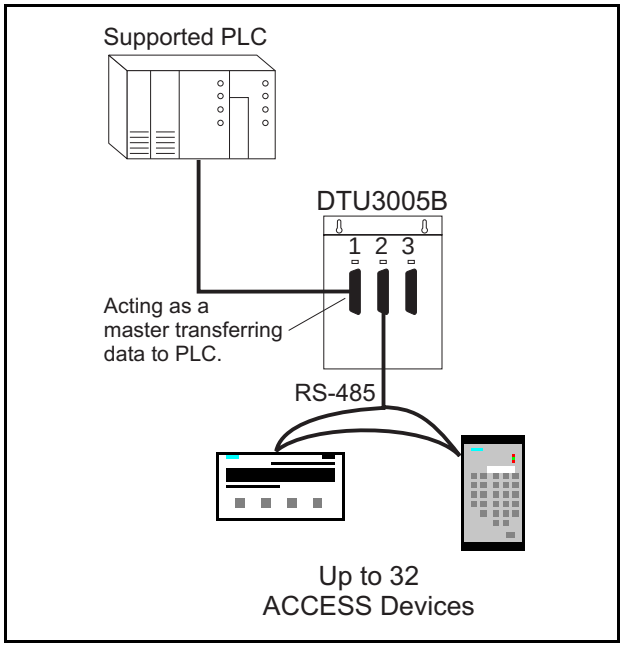


Figure 1.2 PLC to SEAbus Application

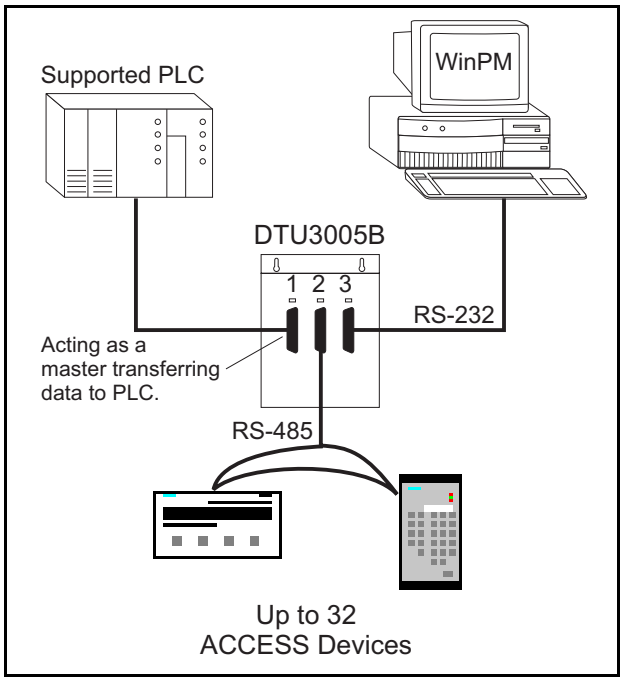


Figure 1.3 PLC to SEAbus with Passthrough

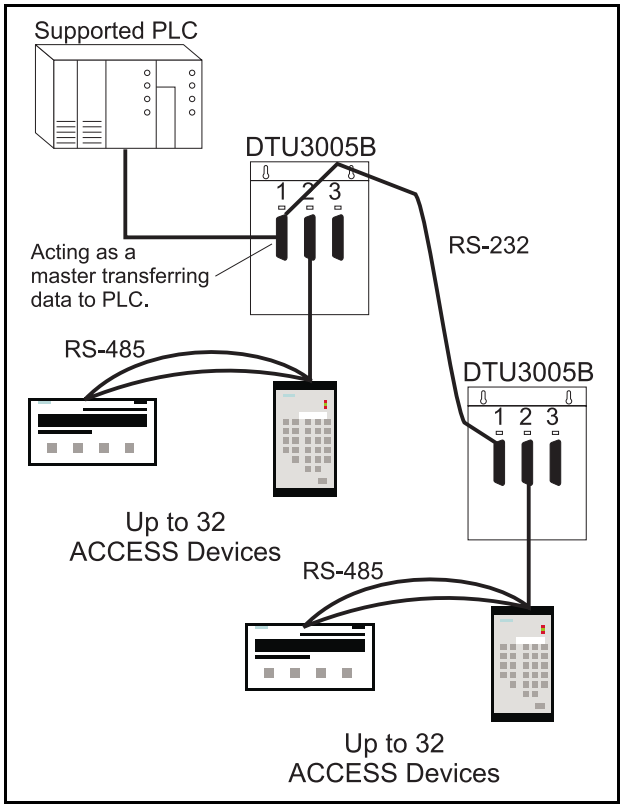


Figure 1.4 Daisy Chained DTU3005 Units

1.4.2 Modbus Master to SEAbus

The DTU3005 unit can be configured as a Modbus (RTU) slave. In this configuration, a Modbus master device (usually a SCADA system) is connected to port 1. The Modbus master uses the DTU3005 to monitor and/or control Siemens ACCESS devices. A typical Modbus application is shown below in **Figure 1.5**. The passthrough port (port 3) can be used to connect to a supervisory computer running WinPM software. It can also be used to connect to a second, independent Modbus Master device. This is shown in **Figure 1.6**. Up to 32 DTU3005B units can be daisy chained using a cable connected to port 1 of the three units. Each DTU3005B device should have a different Modbus device number. A daisy chained configuration is shown in **Figure 1.7**.

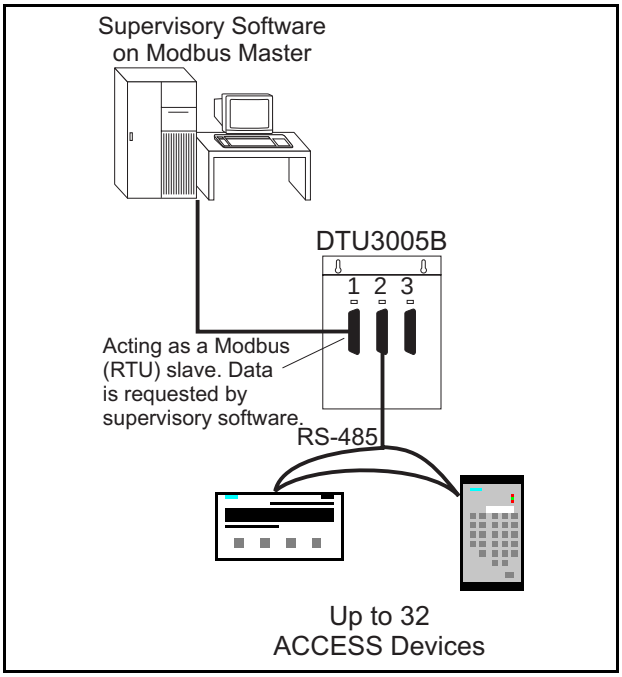


Figure 1.5 Modbus Master to SEAbus

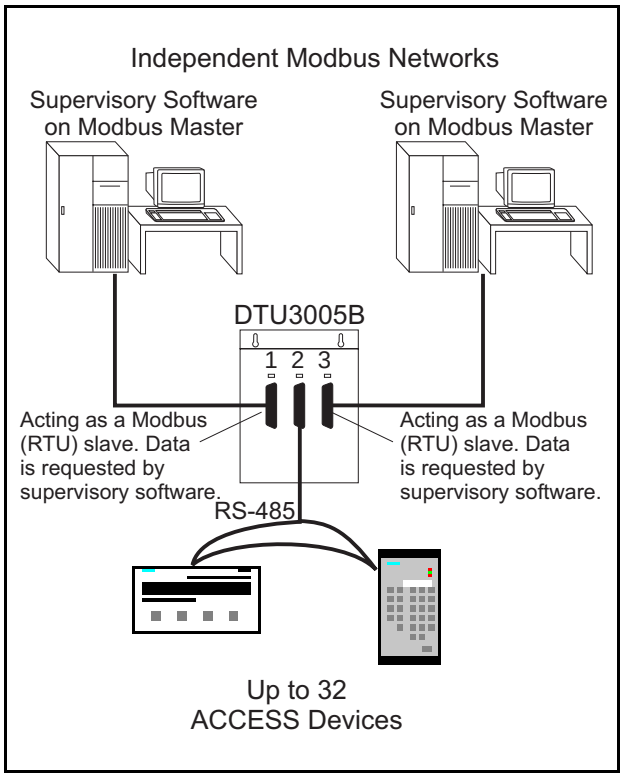


Figure 1.6 Two Independent Modbus Master Devices to SEAbus

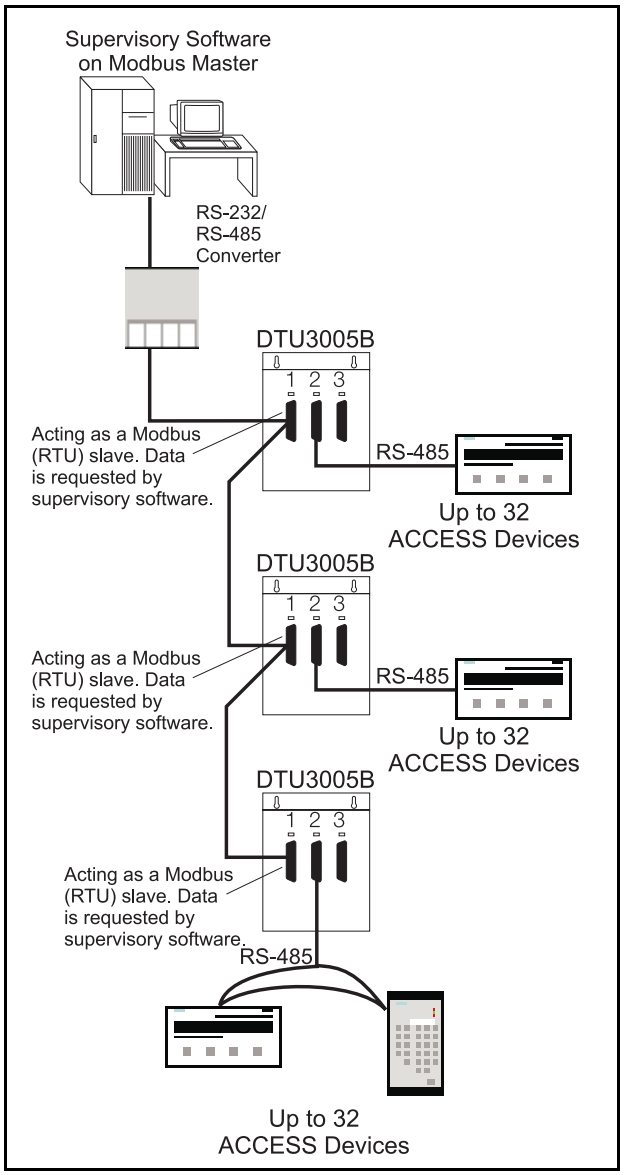


Figure 1.7 Connection to Modbus Master using a Multidrop Cable

Multi-Drop Modbus Master to SEAbus

By using a Siemens Isolated Multi-Drop Converter, you can connect your Modbus Master device to four DTU3005 devices. Each DTU3005 can connect to up to 32 Siemens ACCESS devices, as well as be daisy chained to up to 32 additional DTU3005 devices. An example configuration is shown below in **Figure 1.8**.

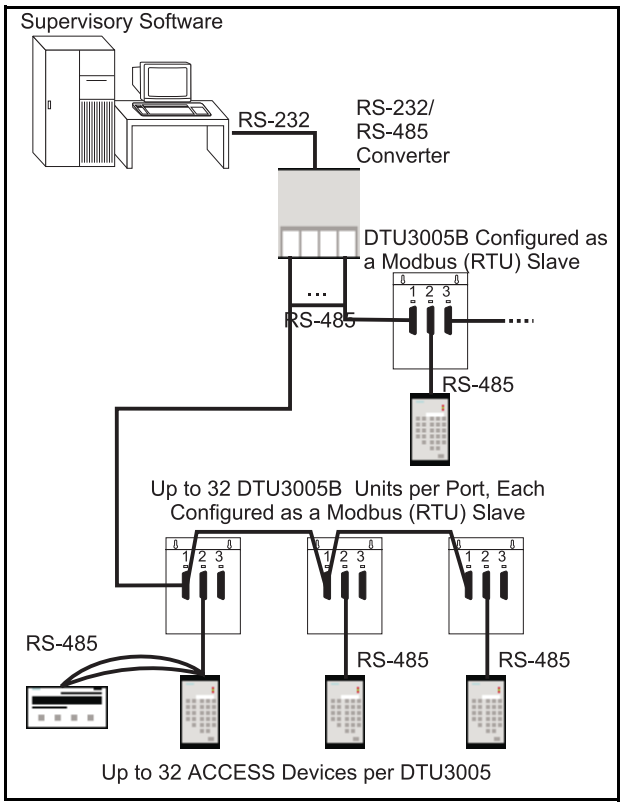


Figure 1.8 Multi-Drop Configuration

1.4.3 SEAbus Port Expander

The DTU3005 can be used as a SEAbus port expander for ACCESS devices, allowing two personal computers running WinPM (or other supervisory software) to communicate with up to 32 ACCESS devices. This configuration is shown below in **Figure 1.9**.

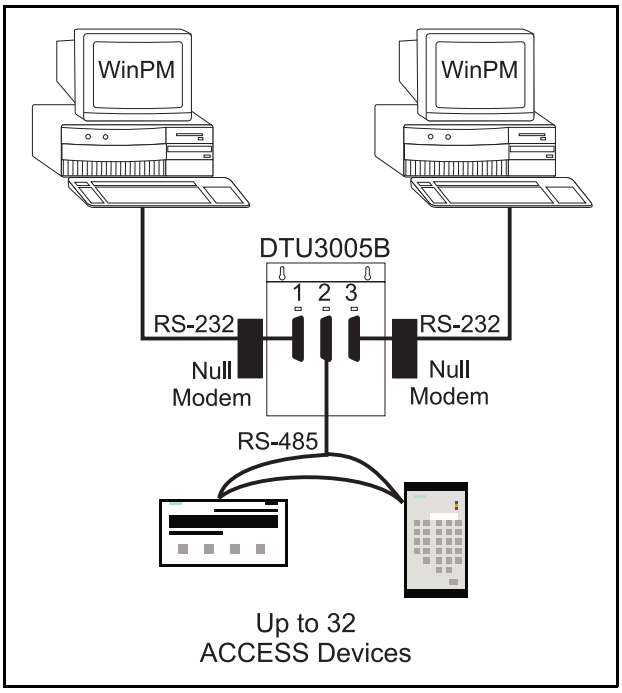


Figure 1.9 SEAbus Port Expander

2 Installing the Software

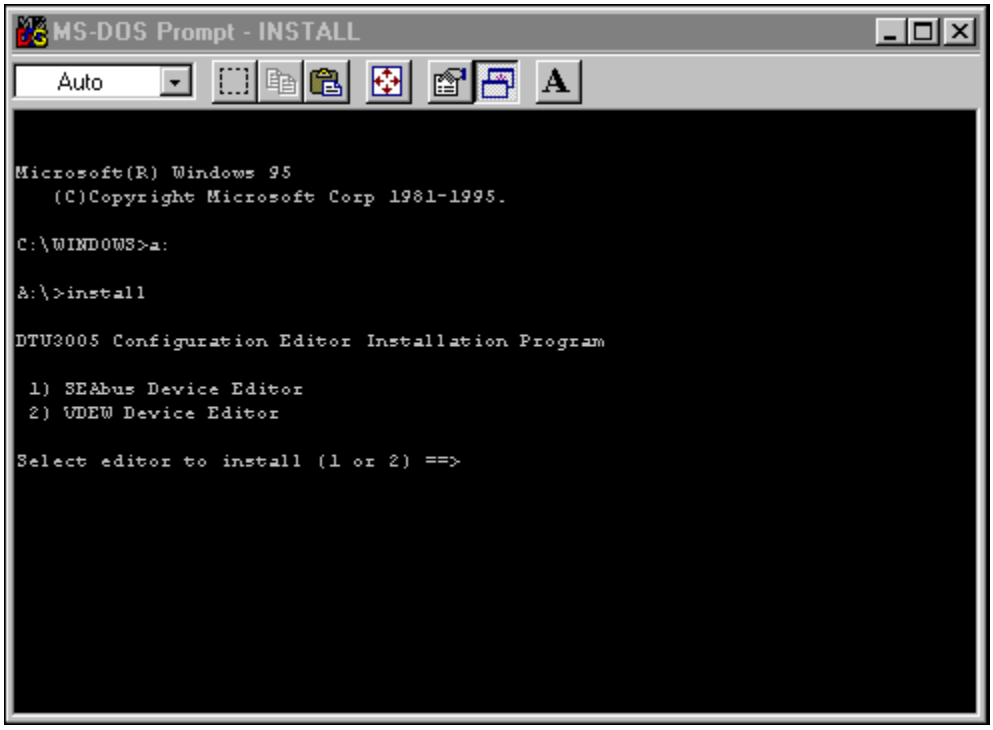
The DTU3005 Editor software can be installed from the DOS prompt onto a PC running Microsoft® Windows version 3.1, 95, or 98. The PC processor must be less than 300 MHz (or have a utility program installed to slow down the processor speed) for the Editor software to work properly.

Note: The DTU3005 Editor software does not work in a Windows NT environment.

If you are running Windows 3.1, double click the MS-DOS Prompt icon in the **Main** window of Program Manager. For Windows 95/98, select **MS-DOS Prompt** from the **Start** menu. To install the Editor software, insert the installation diskette into your computer and follow the steps listed below. The computer screen, showing the computer prompts and user responses, is shown below.

1. Change the current drive at the DOS prompt to the diskette drive. Type **`A:`** (or **`B:`** if that is your 3½" diskette drive), and then press **Enter**.

2. At the **`A:\>`** prompt, type **`install`**, and then press **Enter**. The installation prompts you to select which Editor software to install, as shown in the example screen below. Type **`1`** and press **Enter** to install the SEAbus Device Editor, or type **`2`** and press **Enter** to install the VDEW Device Editor.



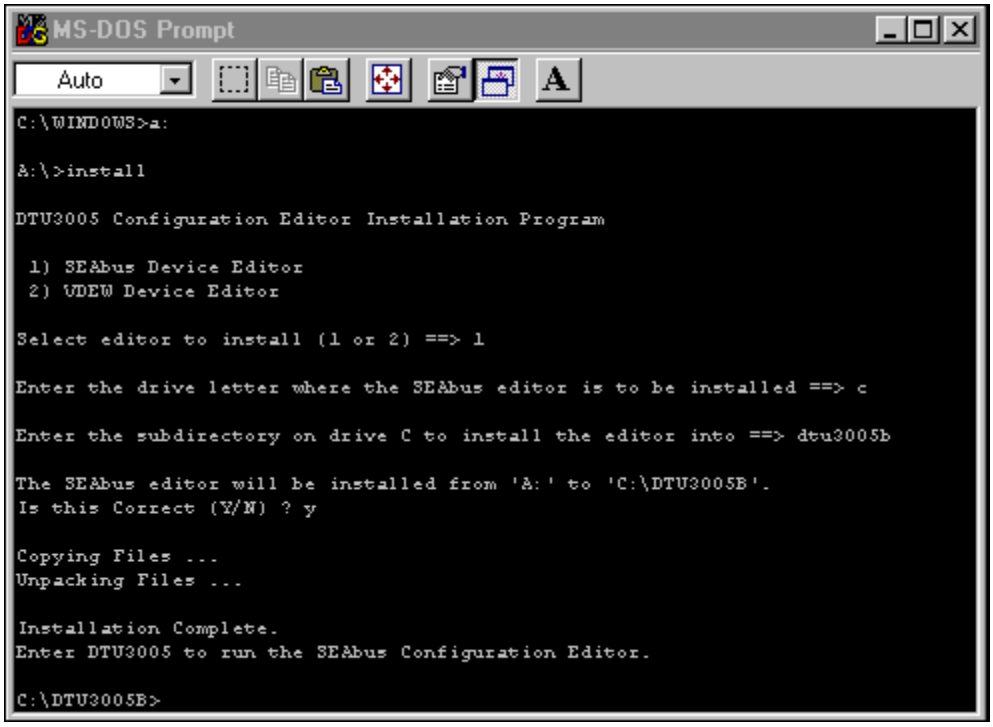
3. The program asks on which drive you want to install the Editor software. For most computers, this will be drive C. Type **`c`** and press **Enter**.

4. The installation program then asks to which subdirectory you want to install the DTU3005 Editor software. This is where the program and configuration files will be placed. The suggested directory name is **DTU3005B**. Type the directory name at the prompt and press **Enter**.

5. You will now verify your drive and directory choices. The installation program repeats your entries and asks if the information is correct. Enter **`Y`** if it is correct, and **`N`** if it is incorrect or you have changed your mind. Then press **Enter**.

6. The installation program copies and unpacks the editor program files onto your hard drive and

returns you to the DOS prompt as shown in the example screen below.



7. If you are running Windows, type **exit** to close the DOS window.

3 Starting the Software

To start the DTU3005 Editor software, follow these steps:

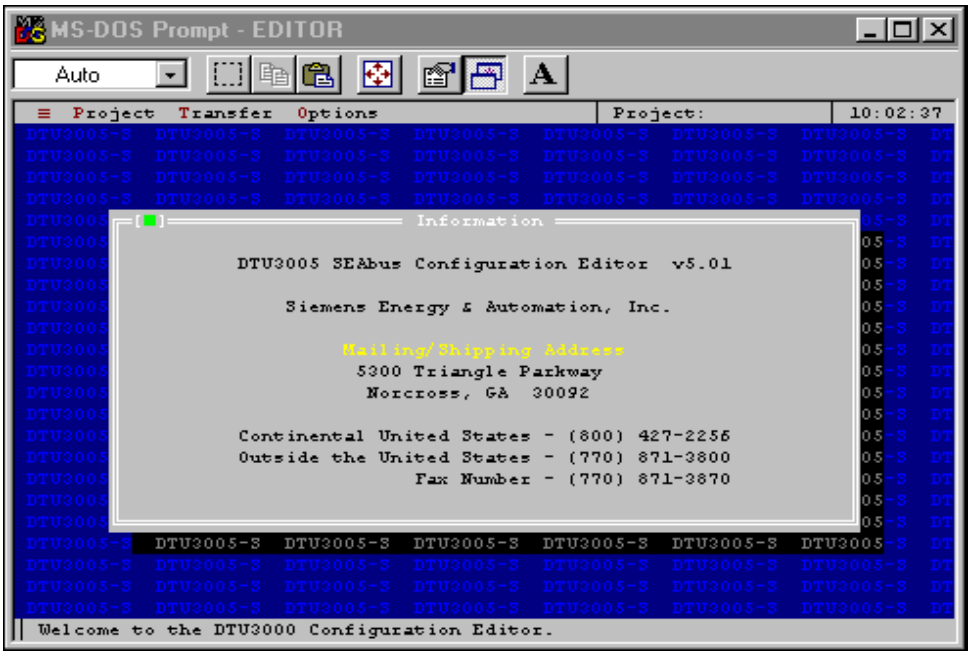
1. If you are running Windows 3.1, double click the **MS-DOS Prompt** icon in the Main window of Program Manager. For Windows 95/98, select **MS-DOS Prompt** from the **Start** menu.

2. At the DOS prompt, which is usually **C:\>** (or **C:\WINDOWS>** if you are running a DOS prompt from Windows) type **CD \DTU3005B**, where DTU3005B is the directory where the Editor software is installed. Press **Enter**.

3. At the new DOS prompt (which is **C:\DTU3005B>** if you installed the program to the suggested directory), type **DTU3005** and then press **Enter**.

4. The DTU3005 Editor software starts. An information screen appears as shown below.

5. Press **Enter** or **Esc** to close this information screen and start using the program.



3.1 Menu Navigation

Navigation of the program menus and dialog boxes can be performed with either the keyboard or a mouse. The Editor software uses the standard menu and dialog box user interface used by many other DOS and Windows programs. The mouse can be used to make menu selections, highlight and select items in a dialog box, and perform commands by clicking on dialog box buttons. Keyboard equivalents to mouse actions are described in **Table 3.1** below. Informational messages are displayed on the bottom line of the screen to give you help with keyboard navigation.

Note: To use a mouse in DOS, be sure the mouse driver is loaded before starting the Editor software. This is usually done automatically from a command in the CONFIG.SYS or AUTOEXEC.BAT startup files, or if you are running the program from Windows, by Windows itself. For information on how to load a mouse driver, refer to the instructions included with your mouse.

Table 3.1 Keyboard Shortcuts for Menu Navigation

Key	Description
Arrow keys	Moves the highlight in the direction of the arrow.
Enter	Performs the highlighted command.
Esc	Cancels a function, closes the menu or dialog box, and returns you to the previous menu or dialog box.
Tab and Shift+Tab	The **Tab** key moves forward one item at a time within a dialog box. **Shift+Tab** moves backward one item at a time.
Letter keys	The colored letter in each menu item indicates which key performs that command.
Spacebar	Selects or deselects a highlighted item.
Alt + Q	Quits the program.

3.2 Main Menu

The main menu is located on the top line of the screen. In addition to the menu selections, the name of the current project and the time of day is displayed on the top line. There are five main menu selections. They are

- ≡, or the **Program Information** menu. Selecting it displays the program information screen.
- The **Project** menu enables you to create, load, save, view and print project files. It also allows you to switch to a DOS prompt or quit the program. Its operation is described below in **Section 3.3** and **Section 3.4**.
- The **Edit** menu enables you to configure projects and is available only when a project is open. **Chapters 4, 5,** and **6** describe the process of configuring the different project types.
- The **Transfer** menu uploads and downloads project files to the DTU3005 unit. These procedures are described in **Chapter 7**.
- The **Options** menu allows you to change settings on where the program finds its project files, and which COM and LPT ports to use. Its operation is described in **Chapter 8**.

3.3 Using the Project Menu

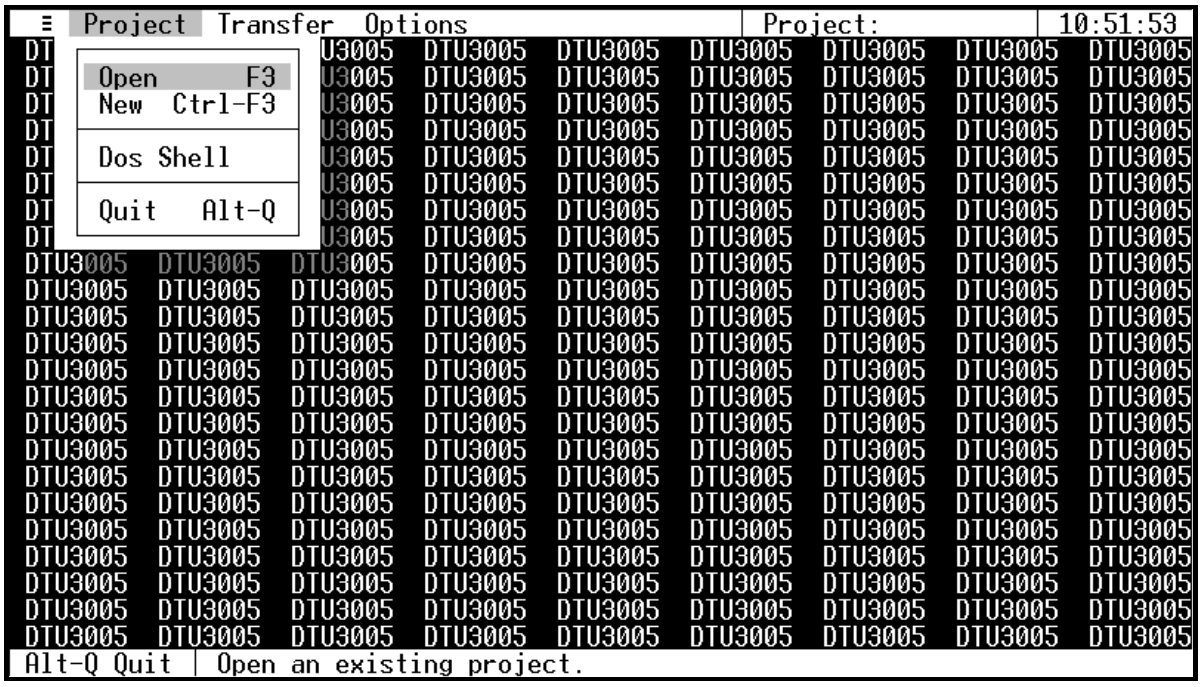
When you first start the DTU3005 Editor software, and no project file is loaded, the following menu selections are available in the **Project** menu (see example screen below):

- **Open**, allows you to open any saved project file.
- **New**, allows you to create a new project file.
- **Dos Shell**, allows you to switch to MS-DOS without closing the DTU3005 Editor software. To return to the program, type **`exit`** and then press the **Enter** key at the DOS prompt.
- **Quit**, allows you to exit the DTU3005 Editor software.

3.4 Starting a New Project

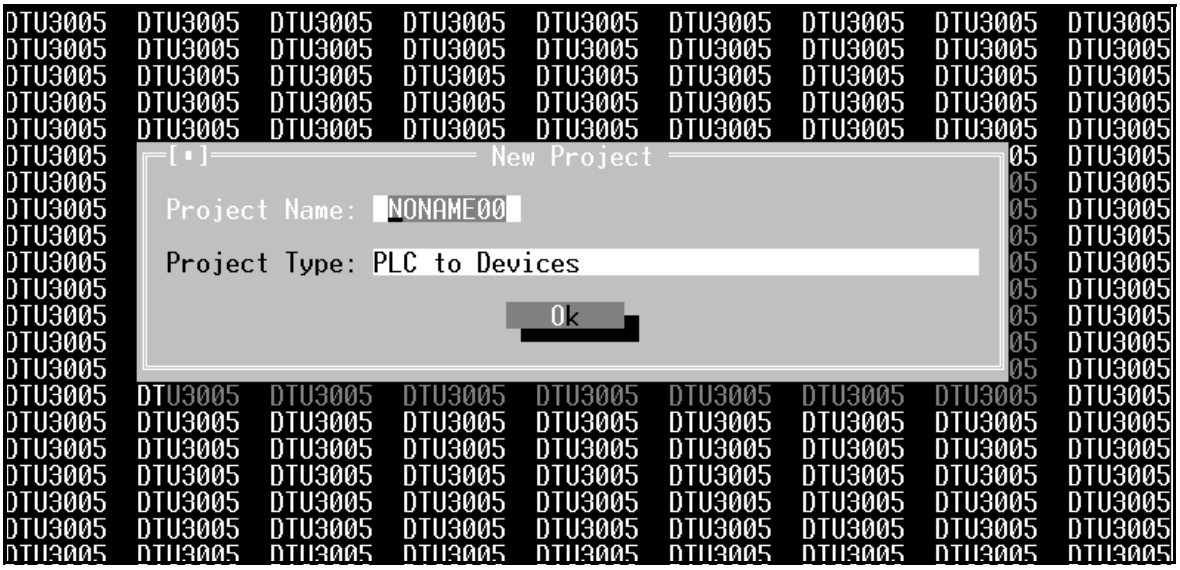
Projects contain the configuration information to be downloaded to the DTU3005 device. To create a new project:

1. Select the **Project** menu with the mouse, or use the arrow keys to highlight **Project** and display the **Project** menu:



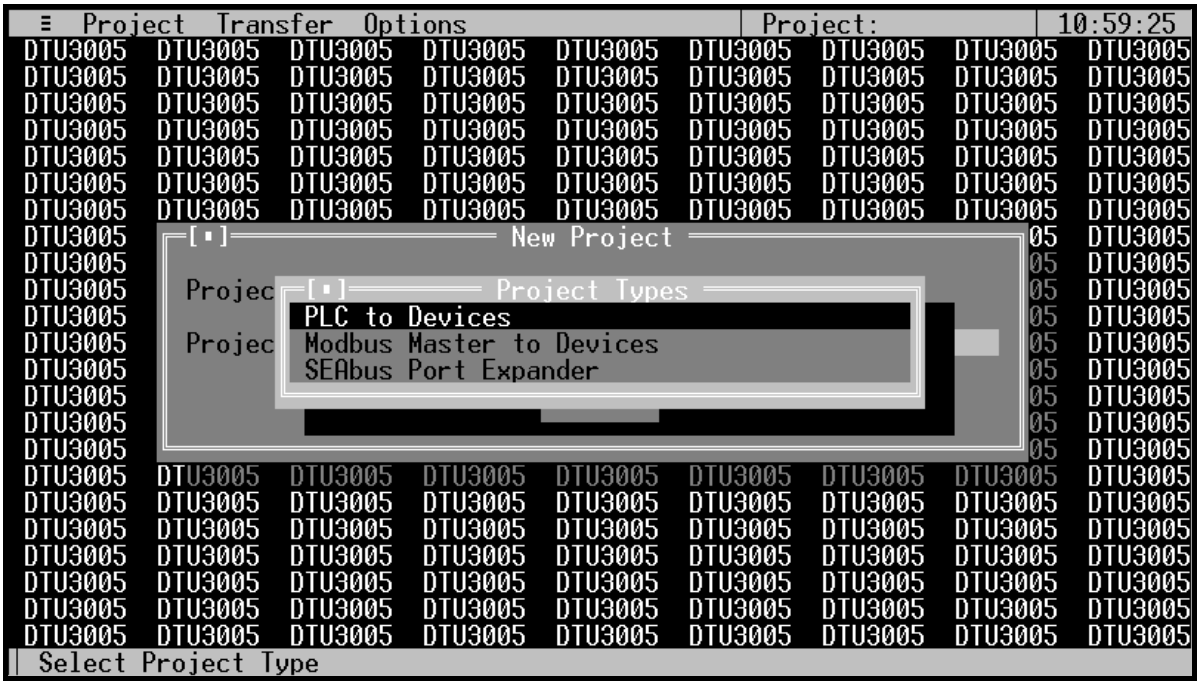
2. Select **New** with the mouse, use keyboard shortcut **Ctrl + F3**, or use the arrow keys to highlight **New** and press **Enter**. The **New Project** dialog box appears.

Note: All menus and dialog box selections are accessible from the keyboard or by using the mouse. From this point the manual will only say "select this" or "highlight this." Refer to **Section 3.1** for menu navigation instructions and keyboard shortcuts.



3. Type in a name for the project up to eight letters and numbers in the **Project Name:** field and press **Enter**. The **Project Type:** field will then be highlighted. Press the **spacebar** to display the project types, which are:

   - **PLCs to Devices**—allows a PLC to control and/or monitor up to 32 supported Siemens devices. See **Chapter 4** for configuring this project type.
   - **Modbus Master to Devices**—allows a Modbus speaking host system, personal computer running SCADA software, or PLC to read and write registers in up to 32 supported Siemens devices. See **Chapter 5** for configuring this project type.
   - **SEAbus Port Expander**—allows two Siemens ACCESS supervisory computers to connect up to 32 Siemens ACCESS devices. See **Chapter 6** for configuring this project type.



4. To select a project type, highlight the type and either press **Enter** or click the left mouse button. Then highlight the **Ok** button on the dialog box and either press **Enter** or click the left mouse button.

5. When the screen refreshes, the **Project** menu is displayed with additional menu options now available. These options apply to the open project file that is active (i.e., the project name appears in the top line of the screen).

   - **Close**—allows you to close a project file. (More than one project file can be open at any time.)

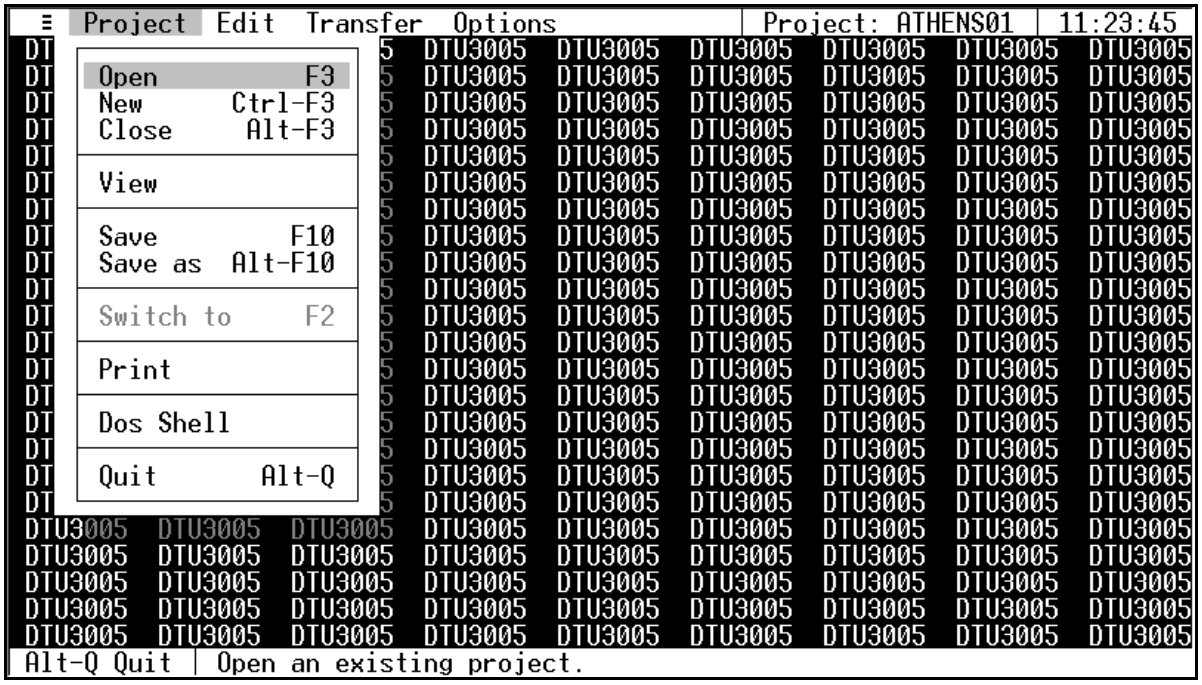
   - **View**—allows you to view a project information screen which shows the project file name, project file type, the selections for each of the DTU3005's ports, and the number of devices.

   - **Save**—allows you to save the current project file.

   - **Save As**—allows you to save the project file under a different file name.

   - **Switch To**—allows you to switch between the opened project files. (Multiple project files can be open at the same time.)

   - **Print**—allows you to print the project file's configuration information.



6. Select **Save**, or use the keyboard shortcut **F10** to save your new project. You are now ready to configure your project.

4 Creating Project Files—PLC to Devices

This chapter covers configuration of the DTU3005 for PLC communications with Siemens devices. Once you have created a PLC to Devices project (see **Chapter 3**), follow the directions in this chapter to configure the project file. Then see **Chapter 7** for directions on downloading the project to the DTU3005. See also **Appendix D** for wiring diagrams for your particular PLC, as required.

4.1 Application Description

The PLC to Devices application allows a PLC to control and monitor up to 32 SEAbus devices or Siemens protective relays. In this application, the DTU3005B initiates all communications with both the PLC and the Siemens devices.

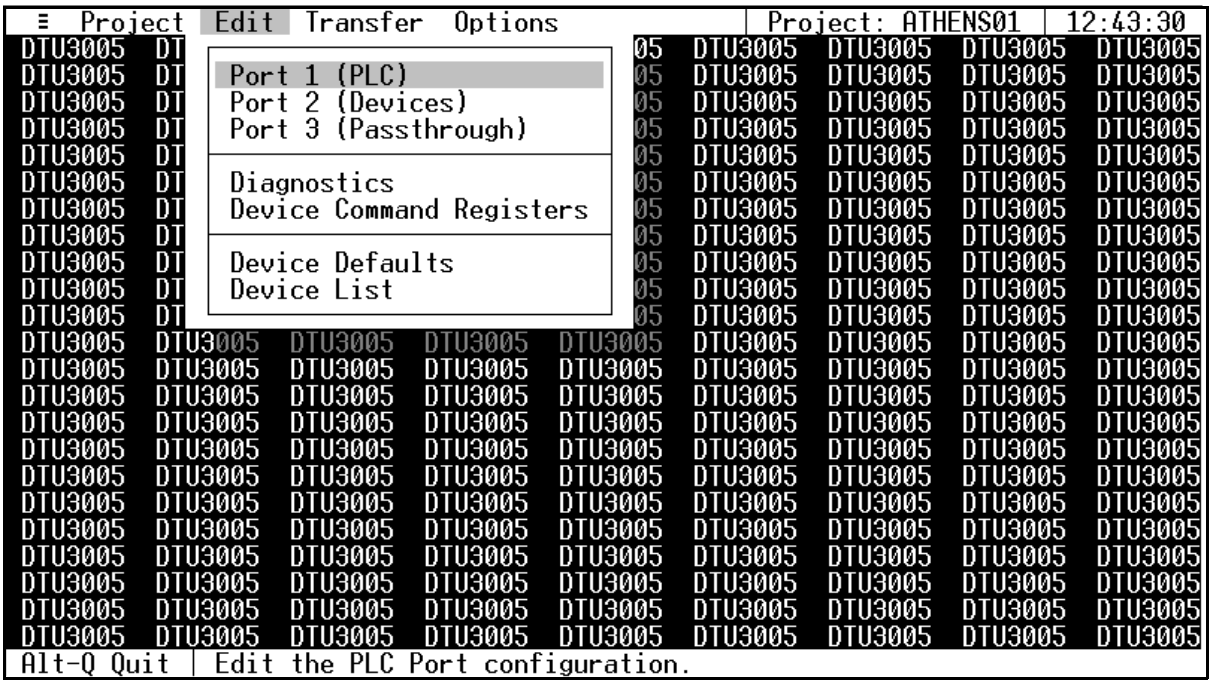
The DTU3005B uses an internal transfer table to transfer data to the PLC. The transfer table contains a block of selected real-time data parameters obtained from a device. The DTU3005B unit acts as a master to the PLC, and continuously transfers the table data to the selected block of registers on the PLC. A delay option is provided for each device's table entry to prevent unnecessarily slowing down the scan time of the PLC as well as to give some device data transfers higher priority than others.

No ladder logic is required on the PLC to use the basic feature of this application, which allows a limited amount of information to be transferred between the PLC and the devices. Ladder logic programming is required to use the command block function. The command block is used to send commands to the devices, such as operating or releasing relays, or resetting energy counters. See **Section 4.11** for information on configuring this feature on the DTU3005B. The format of the command registers for each device are described in **Appendix E**.

The DTU3005B can automatically update diagnostic information in the PLC. It allows the PLC to determine when a device is not communicating. See **Section 4.10** for information on enabling and configuring this feature. The format and content of the diagnostic registers are described in detail in **Appendix F**.

4.2 Configuring the Project File

Once you have created or opened the project file, select **Edit** from the main menu to display the following menu items:



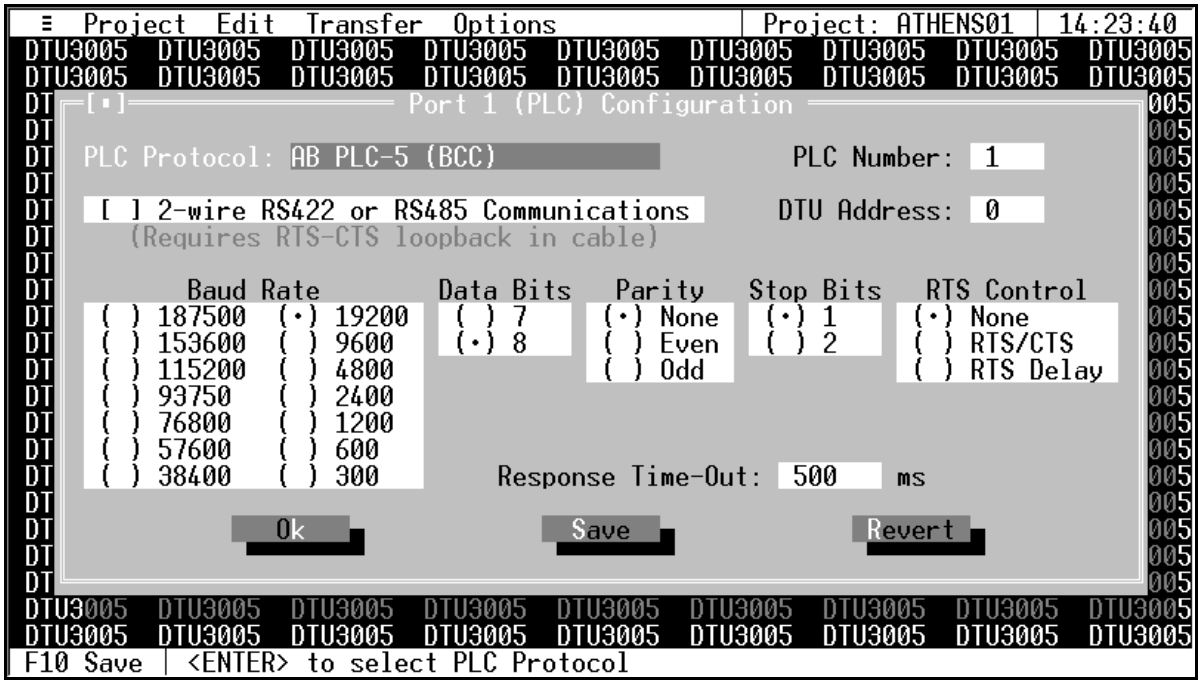
- **Port 1 (PLC)**—allows you to select the model and configure the communications settings for the PLC connected to port 1.
- **Port 2 (Devices)**—allows you to configure communications settings for SEAbus devices or Siemens Protective relays connected to port 2.
- **Port 3 (Passthrough)**—allows you to select whether port 3 is used as a passthrough to the devices or the PLC.
- **Diagnostics**—allows you to indicate if you want the DTU3005 to write communications diagnostic information to the PLC.

- **Device Command Registers**—allows you to indicate which PLC registers will be used for device commands.
- **Device Defaults—**allows you to set the default data registers for more than one device of a certain type, e.g., set the defaults for all 4720 power meters or all S7-I/O units. The data registers can still be customized for each device, as required. See **Section 4.7.2** for more information.
- **Device List**—allows you to indicate which SEAbus devices or Siemens protective relays are connected to port 2 and which PLC registers they are communicating with.

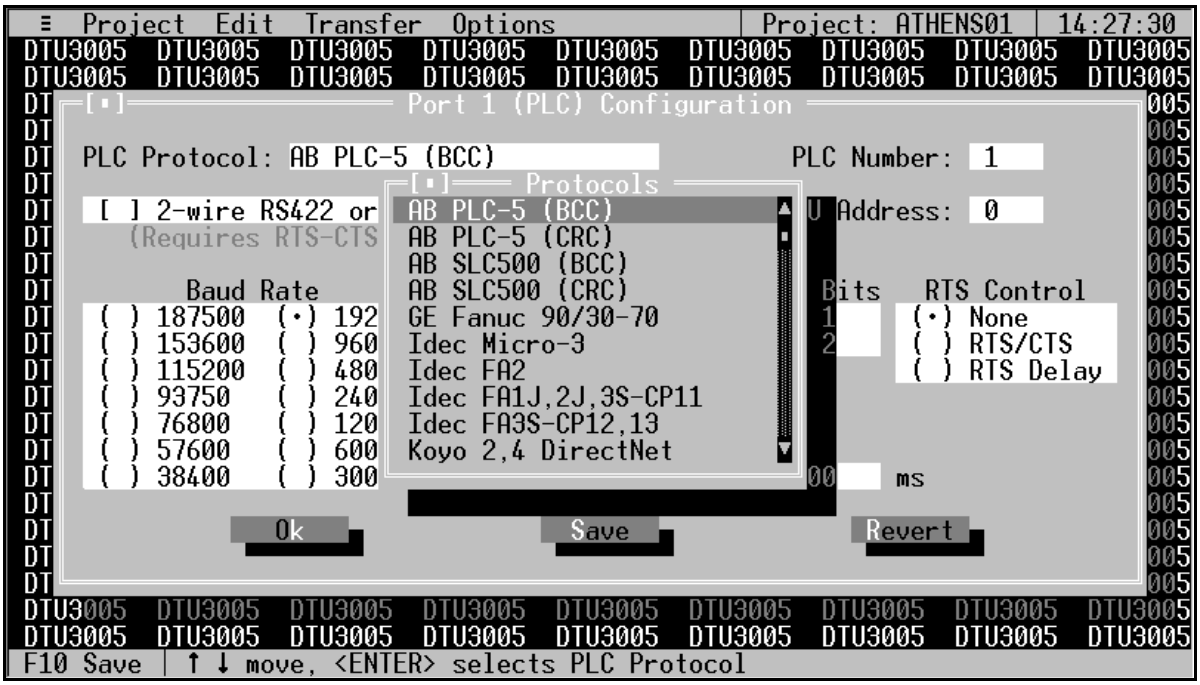
If the Device Protocol for port 2 is set to VDEW (see **Section 4.4**), then two additional menu items are available: **Global Command Registers** and **Device Text to Values Table**. See **Section 4.8** and **Section 4.9** for instructions on using these menu items.

4.3 PLC Setup—Port 1

You must have a PLC to Devices project file open to configure port 1 using the instructions in this section. Select **Port 1 (PLC)** from the **Edit** menu, and the Port 1 PLC Configuration screen appears.



To select the PLC connected to port 1, highlight **PLC Protocol** and press **Enter**. The PLC Protocols selection menu appears:



PLC Protocol

Use the **Down Arrow** and **Up Arrow** keys to scroll through the list of available PLC Protocols, since not all choices are visible at one time. To select a protocol, highlight the selection and press **Enter**.

PLC Number

After you have selected your PLC, the **PLC Number** selection box is highlighted. The PLC Number is used to identify which PLC the DTU is to communicate with (if the selected type of PLC is addressable). The PLC Number is often called a PLC Slave Address or Slave ID.

Type in the PLC Number and press **Enter**.

2-Wire RS422 or RS485 Communications

After you have entered the PLC Number, the **2-Wire RS422 or RS485 Communications** selection box is highlighted. This box will only need to be checked if the communications with your PLC is a 2-wire RS485 or RS422 interface. When 2-wire communications are being used, RTS must be looped back to CTS on the DTU side of the cable. This can be done on the RS232 side by looping pins 4 and 5 or on the RS422/485 side by looping 16 to 18 and 17 to 19. See **Appendix D** for wiring diagrams for your particular PLC, and whether it uses a 2-wire connection.

To select the checkbox, click on it with the mouse or, with the **2-Wire RS422 or RS485 Communications** selection highlighted, press the **spacebar**. An “X” will appear inside the brackets when it is selected.

Press the **Tab** or **Right Arrow** key to move to the next field without selecting this checkbox.

DTU Address

Some PLC protocols require each device on the PLC network to be assigned a unique address or ID. The **DTU Address** is the address assigned to the DTU on the PLC network. Highlight this field and type in the address number for the DTU3005B, then press **Enter**.

Communications Settings

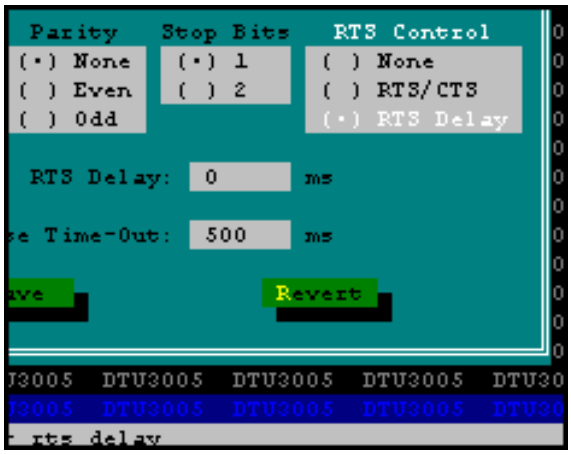
The communications settings are automatically set to the default values for each type of PLC when the PLC is first selected. Before changing any of these settings, consult your PLC manual for the correct settings. To move between the communications settings, press the **Tab** or **Enter** keys. To select a setting, use the **Up** or **Down Arrow** key to move to the desired setting and press the **spacebar** to change your selection.

RTS Control (Request to Send Control)

RTS Control selection is an option provided for modems or for PLCs that require RTS to be active only while the DTU is transmitting to the PLC.

- If **RTS/CTS** is selected, the DTU will activate RTS and wait until CTS is active before transmitting to the PLC.
- If **RTS Delay** is selected, the DTU will activate RTS and wait for the specified delay time to pass before transmitting to the PLC. When **RTS Delay** is selected, the

program displays an entry box for the RTS delay time. Enter the time in milliseconds.



Response Time-Out

The **Response Time-Out** tells the DTU how long to wait after transmitting a request to the PLC if no response has been received from the PLC. After this amount of time passes with no response being received, the DTU will assume that no response is coming and will retry the request. Enter the time in milliseconds.

Saving Port 1 Configuration Information

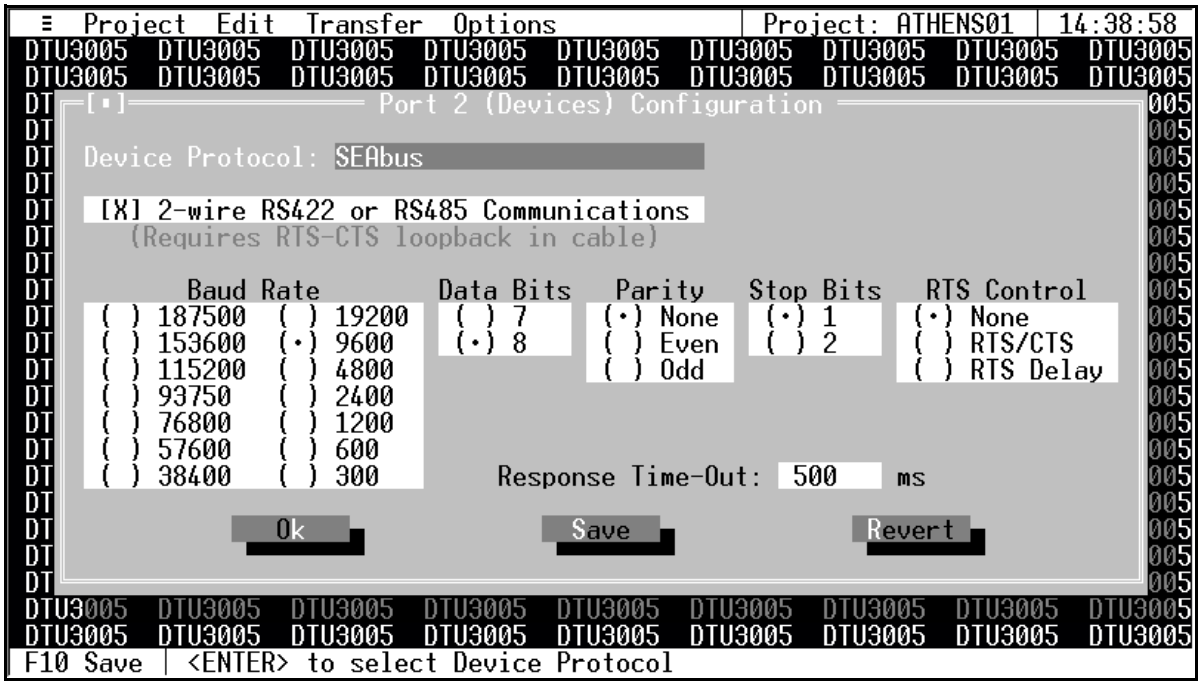
Once you have entered all the configuration information, select **Save** to save the configuration to the project file. Then select **Ok** or press the **Esc** key to close the configuration screen.

If you have changed the configuration and have not saved it to the project file, you will be prompted to either save or discard the changes. Select **Revert** to return to the last previously saved configuration without saving any changes.

4.4 Device Setup—Port 2

One or more Siemens devices may be connected to port 2. You must have a PLC to Devices project file open to configure port 2 using the instructions in this section.

Select **Port 2 (Devices)** from the **Edit** menu, and the Port 2 configuration screen appears.



Device Protocol

The **Device Protocol** indicates which Siemens devices can be connected to port 2. This protocol is based on which version of the DTU3005 Editor software was installed as described in **Chapter 2**.

- The **SEAbus** protocol (as shown in the example screen above) indicates connection to Siemens ACCESS communicating trip units, relays, power meters and other devices.
- The **VDEW** protocol indicates connection to Siemens protective relays using the VDEW protocol.

Note: Not all Siemens devices are supported. For a list of supported devices, see **Appendix B**.

Other Configuration Information

The remaining configuration selections are the same as those for port 1. Refer to **Section 4.3** for instructions on these fields.

Saving Port 2 Configuration Information

Once you have entered all the configuration information, select **Save** to save the configuration to the project file. Then select **Ok** or press the **Esc** key to close the configuration screen.

If you have changed the configuration and have not saved it to the project file, you will be prompted to either save or discard the changes.

Select **Revert** to return to the last previously saved configuration without saving any changes.

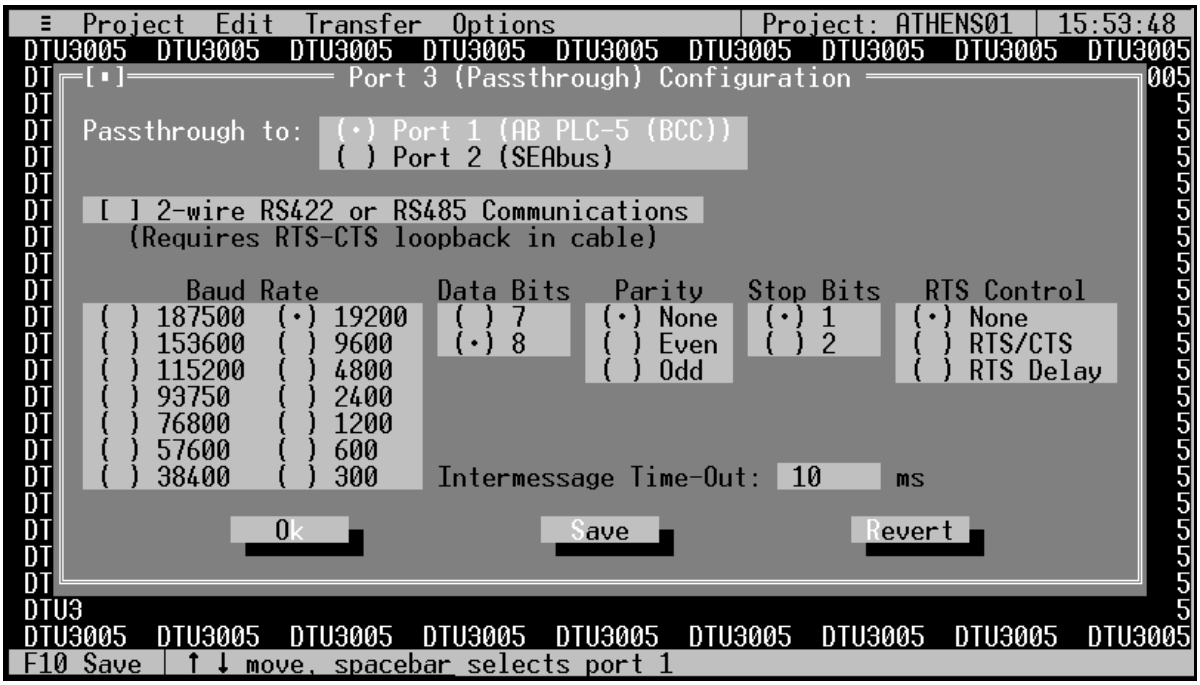
4.5 Passthrough Setup—Port 3

Port 3 is for passthrough communications. It allows direct communication with either the PLC on port 1 or the Siemens SEAbus devices on port 2. (Passthrough communications to port 2 are not available for VDEW devices.)

In passthrough mode, any messages received on port 3 of the DTU are simply "passed through" to the PLC (port 1) or devices (port 2). For example, passthrough communications enables a PC running WinPM, or other supervisory software connected to port 3 of the DTU3005, to communicate directly with the SEAbus devices connected to port 2.

You must have a PLC to Devices project file open to configure port 3 using the instructions in this section.

Select **Port 3 (Passthrough)** from the **Edit** menu, and the Port 3 configuration screen appears.



The first option on the configuration screen allows you to choose passthrough to port 1 or port 2. Select the appropriate port with the mouse, or use the **Up** or **Down Arrow** keys to highlight the selection and press **Enter**.

The remaining configuration selections except for Intermessage Time-out are the same as those for port 1. Refer to **Section 4.3** for instructions on these fields.

Intermessage Time-Out

The DTU3005 uses the intermessage time-out to determine when a complete message has been received on the passthrough port. Once the first character of a message has been received, if the amount of time specified by the intermessage time-out passes with no additional characters being received, the DTU3005 will consider the message to be complete and process it.

To change the intermessage time-out, select **Intermessage Time-Out** and type in the value in milliseconds, then press **Enter**.

Saving Port 3 Configuration Information

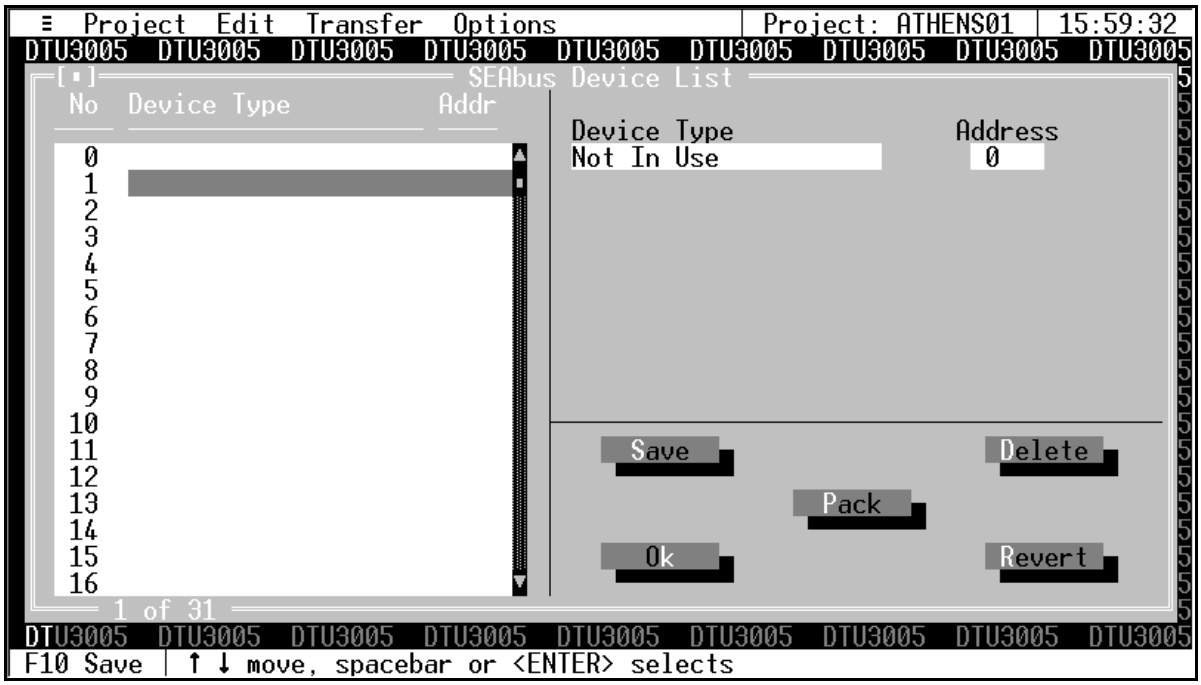
Once you have entered all the configuration information, select **Save** to save the configuration to the project file. Then select **Ok** or press the **Esc** key to close the configuration screen.

If you have changed the configuration and have not saved it to the project file, you will be prompted to either save or discard the changes. Select **Revert** to return to the last previously saved configuration without saving any changes.

4.6 Device List Setup

The Device List menu item enables you to indicate which registers on the PLC will receive data from the devices. In this screen, you will enter the device type and address for each Siemens device connected to port 2. You will also indicate to which registers on the PLC you want the DTU3005 to write device data.

Select **Device List** from the **Edit** menu to display the device list screen:



This screen is divided into two parts:

- On the left side of the screen is a list of the devices connected to port 2 (the list is initially empty). Up to 32 devices can be attached; however, only 17 of the devices are visible on the screen at one time. To see all the devices, click on the scroll bar with the mouse, or use the **Up** and **Down Arrow** and **Page Up** and **Page Down** keys.

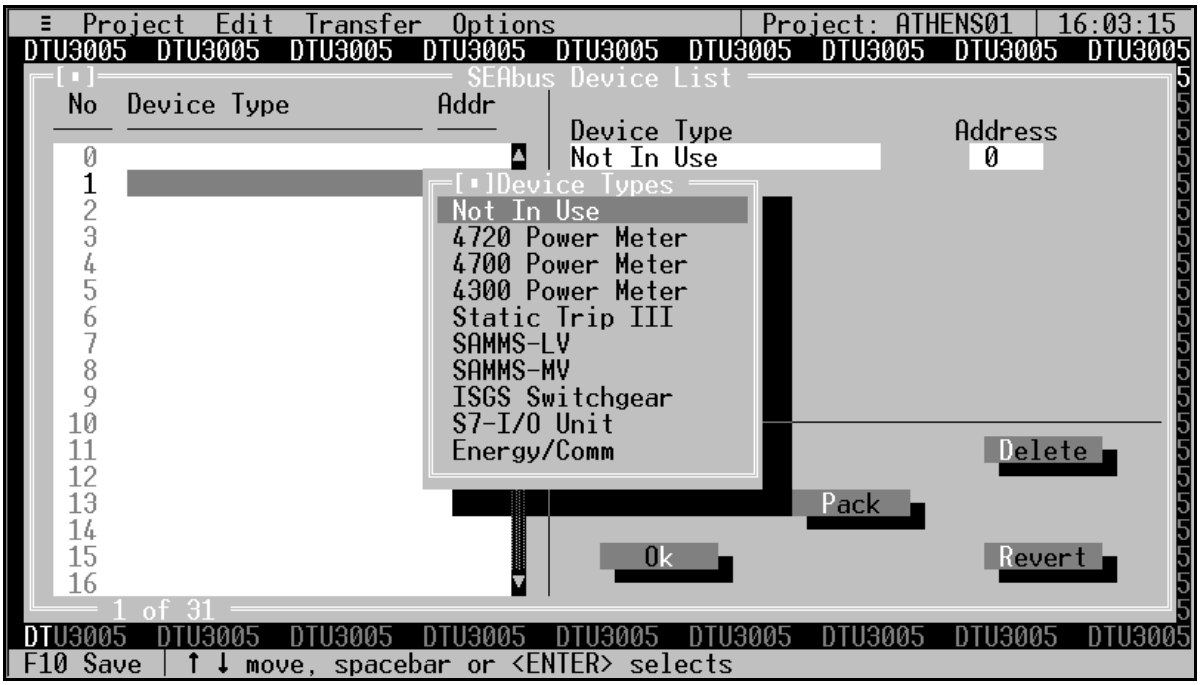
- The right side of the screen is used to configure the data register information for the selected device, as shown in the example screen on the next page. You can add or delete devices, or change device configuration by highlighting the **Device Type** on the left side of the screen, then using the fields and buttons on the right side of the screen.

Adding a Device

To add a device to the device list:

1. Highlight the first line where the **Device Type** and **Address** fields are blank—this should be the first available device number **No** field.

2. Press **Enter** or **Tab** to add a device. The cursor will move to the **Device Type** field on the right side of the screen. Press **Enter**, and the **Device Types** list displays:



3. Select the device from the list by pressing **Enter** or the **spacebar**. The highlight moves to the **Address** field, and the PLC register fields now display as shown in the example screen below.

4. With the **Address** field highlighted, enter the device's address. This number should be between 1 and 254, and match the number programmed into the device itself. Press the **Tab** key twice to go to the **Real-Time Data Registers** field.

5. Highlight the **File** field and enter the file number. This parameter is used only with Allen-Bradley PLCs to specify the file number in the PLC that contains the register values that are transferred to or from the device.

6. Enter the beginning register number in the **Real-Time Data Registers** field. Refer to **Appendix A** for valid register numbers for your PLC application. The DTU3005 Editor software supplies the last register number after you enter the first. In the example above, the 4700 Power Meter uses 41 registers for its data. When you enter 1 for the first register, the last register becomes 42. If you change the starting register to 10, the last register will automatically change to 51.

   Note: These registers indicate the exact location in the PLC where the DTU3005 will store the real-time data for this device.

7. Press **Shift+Tab**, or click the left mouse button to highlight the **File** field and enter the file number. This parameter is used only with Allen-Bradley PLCs to specify the file number in the PLC that contains the register values that are transferred to or from the device.

8. The device command registers are displayed below the real-time data registers. They are configured from the **Device Command Registers** menu selection on the **Edit** menu. See **Section 4.11** for information on setting these registers and programming the PLC to perform commands. Be sure that the register numbers are not also used by the device. This can cause unexpected operation of the device.

9. If you want to use a customized subset of the available data registers, see **Section 4.7.2** for instructions on creating a default set of custom registers for all devices of the same type. Type an "X" in the **Use customized real-time data ordering?** field to begin the custom data setup, or press **Tab** to go to the next field.

10. Enter the **Real-Time Data Delay Time** in its field. This is the delay from the time that the DTU3005 receives data from the device to the time the DTU3005 transfers the data to the PLCs registers.

11. Select **Save** to save the device information to the project file, and then select **Ok** or press **Esc** to exit the device list configuration screen. If at any time you want to return to the last saved version of the device list, select **Revert** without saving any changes.

Removing a Device

To remove a device from the device list, highlight the device on the left side of the screen and press **Tab** or **Enter**. Then change the device type to **Not In Use**.

Additional Options for Data Registers

The Device List screen has three additional options for working with a device's data registers:

- Select **Set Reg** to place the data registers into contiguous register numbers and minimize the size to the data register block. This option also sets the initial register number to 1.

- The **Set All** command performs the same function as Set Reg, but allows you to set the initial register number. See **Appendix A** for information on acceptable register number ranges for each PLC model.

- Select **Pack** to minimize the size of the command register block, removing registers for deleted devices.

Saving the Device List Configuration

Once you have entered the device information for all the devices attached to port 2, select **Save** to save the device information to the project file. Then select **Ok** or press **Esc** to close the device list configuration screen.

If you have changed the device information and have not saved it to the project file, you will be prompted to either save or discard the changes.

Select **Revert** to return to the last previously saved configuration without saving any changes.

4.7 Configuring Custom Device Registers

You can configure which data items from the SEAbus or VDEW devices are transferred from the DTU3005 device to the PLC or Modbus master. In this way, the DTU3005 acts as a data concentrator, in addition to converting the SEAbus and VDEW protocol data. You can configure the custom data items so that every device of the same type sends the same data items (see **Section 4.7.2**), or have each device send particular data items of interest (see **Section 4.7.1**). SEAbus devices can be configured to send 16 words of device data. VDEW devices can be configured to send from 1 to 64 words.

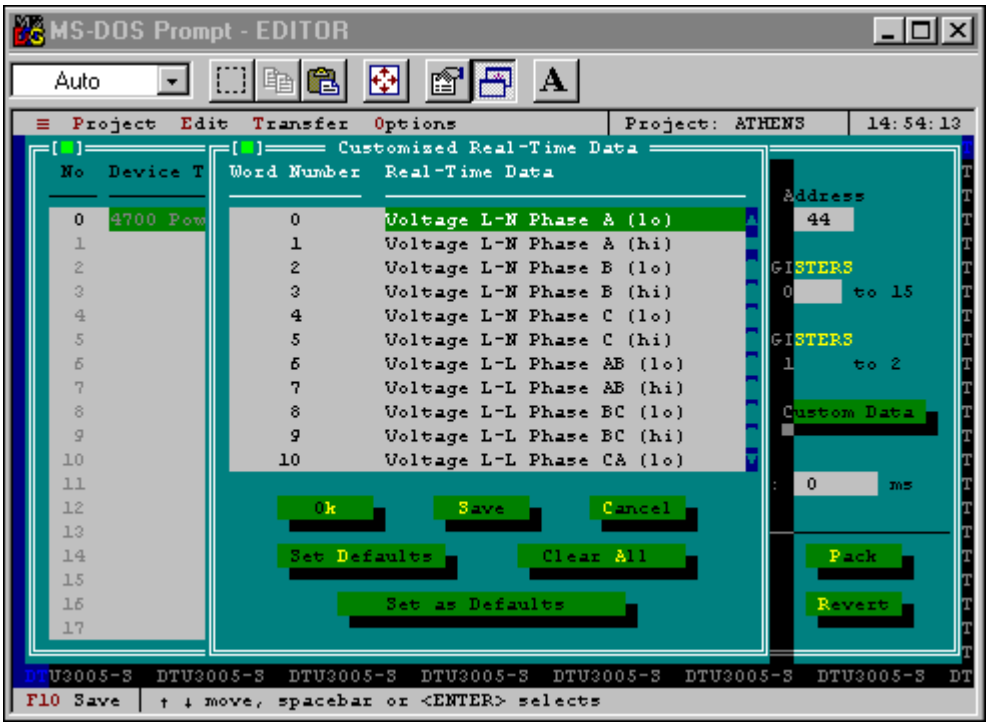
4.7.1 Configuring Custom Registers for a Single Device

To configure custom registers for a single device:

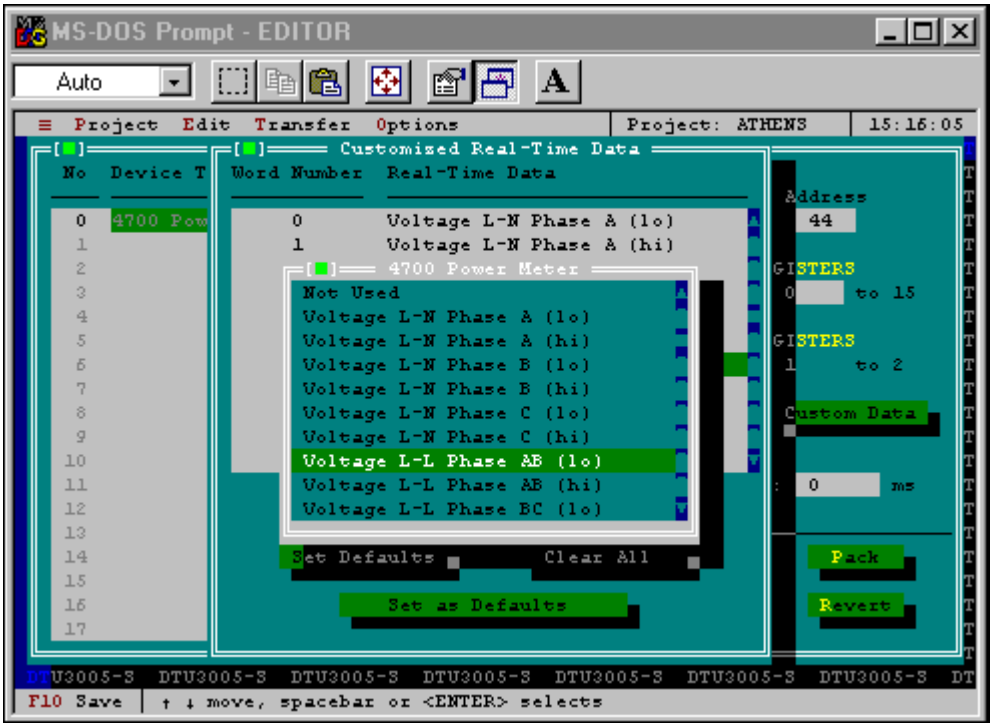
1. Select **Device List** from the **Edit** menu.

2. Highlight the device that you wish to configure and press **Enter**.

3. Highlight the **Use customized real-time data ordering?** check box. Press the **spacebar** to place an "X" in the check box. Then select **Custom Data** to display the Customized Real-Time Data dialog box.



4. Select a data register on the list and press **Enter** to see a list of available real time data. These data items are identical to the standard data items listed in **Appendix E**. Not all data items are visible on the screen at one time. Use the mouse and the scroll bar, or the **Page Up** and **Page Down** keys to view all of the data items.



5. Select the data word (16 bit data) from the list and press **Enter**. Continue to set the other data words in the same manner. Many data items consist of two words (32 bit data). It is important that you configure both words in order to transmit useful information to the DTU3005's registers.

6. Use these options as follows:

   a. Select **Set Defaults** to copy the default custom device registers to the list. See **Section 4.7.2** for instructions on setting custom device registers by device type.

   b. Select **Clear All** to delete all register names from the list.

   c. Select **Set as Defaults** to save the current custom register list as the default custom register list. This will not change the custom registers of other devices of the same type. See **Section 4.7.1** for instructions on setting custom device registers for a single device.

4. Select **Save** to save your custom register list and then **Ok** to exit this dialog box. Select **Cancel** to exit this dialog box without making changes.

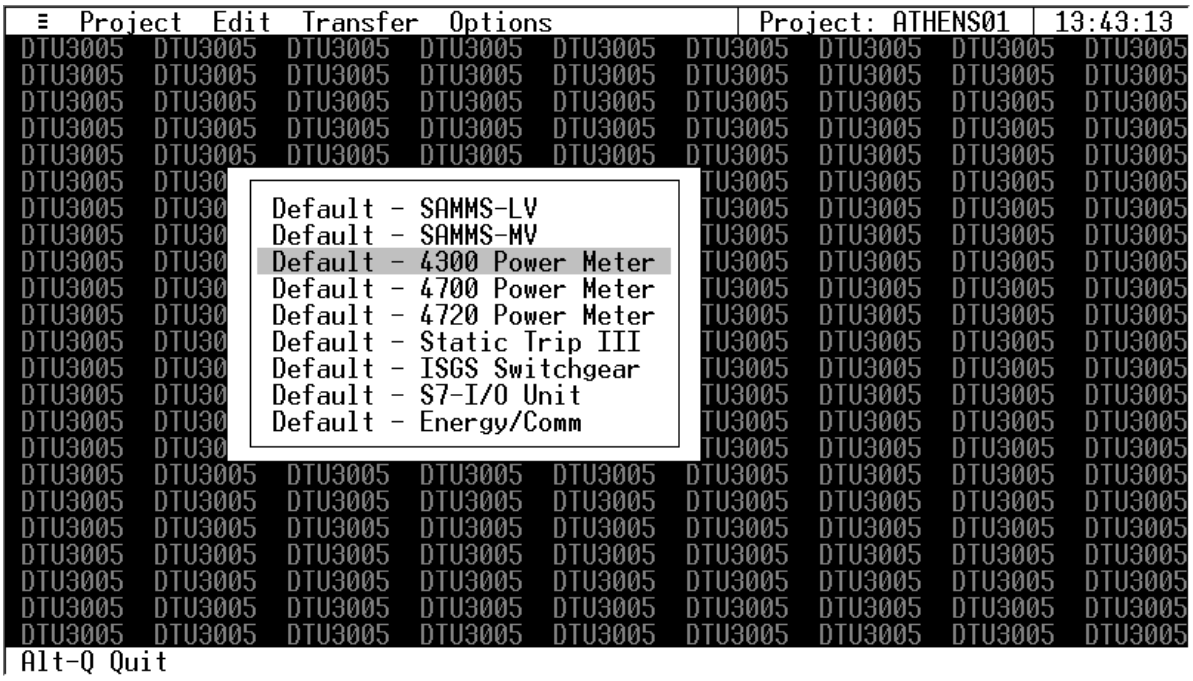
To conserve registers when using VDEW devices, you should set all unused registers to "Not Used" and place them at the end of the list. The DTU3005 will then only allocate registers for those containing device data. (This does not apply to SEAbus devices, for which the DTU3005 allocates 16 registers regardless if they are used or not.)

4.7.2 Configuring Default Custom Device Registers by Device

If you are configuring custom device registers for more than one device of a certain type, you may configure the default custom registers from the Edit Menu **Device Defaults** command. After configuring the default device registers, you may use them for any or all devices, or further customize individual registers for any of your devices. SEAbus devices can have 16 custom registers. VDEW devices may have between 1 and 64 custom registers.

To configure default custom registers for a particular device type:

1. Select **Device Defaults** from the **Edit** menu. A list of devices appears. If you have configured port 2 for SEAbus devices, only SEAbus devices will appear on the menu. Likewise, if you have configured port 2 for VDEW devices, only VDEW devices will appear on the menu.



2. Select the device you wish to configure. The default custom register configuration menu appears. The first time you select this command, the first 16 registers (64 for VDEW devices) from the device's standard data register list appear on the default real-time data list. Not all of the entries are visible on the menu. Use the scroll bar or the **Page Up** and **Page Down** keys to view all the entries.

3. Select a data item and press **Enter** to see a list of device real time data that can be assigned to that data word. Select **Not Used** if you do not want that data word to be used. Not all of the entries are visible on the menu. Use the scroll bar or the **Page Up** and **Page Down** keys to view all the entries. Select **Clear All** to set all data words to "Not Used." Select **Set to Base** to restore the data words to the first 16 registers (64 for VDEW devices) from the device's standard data register list.

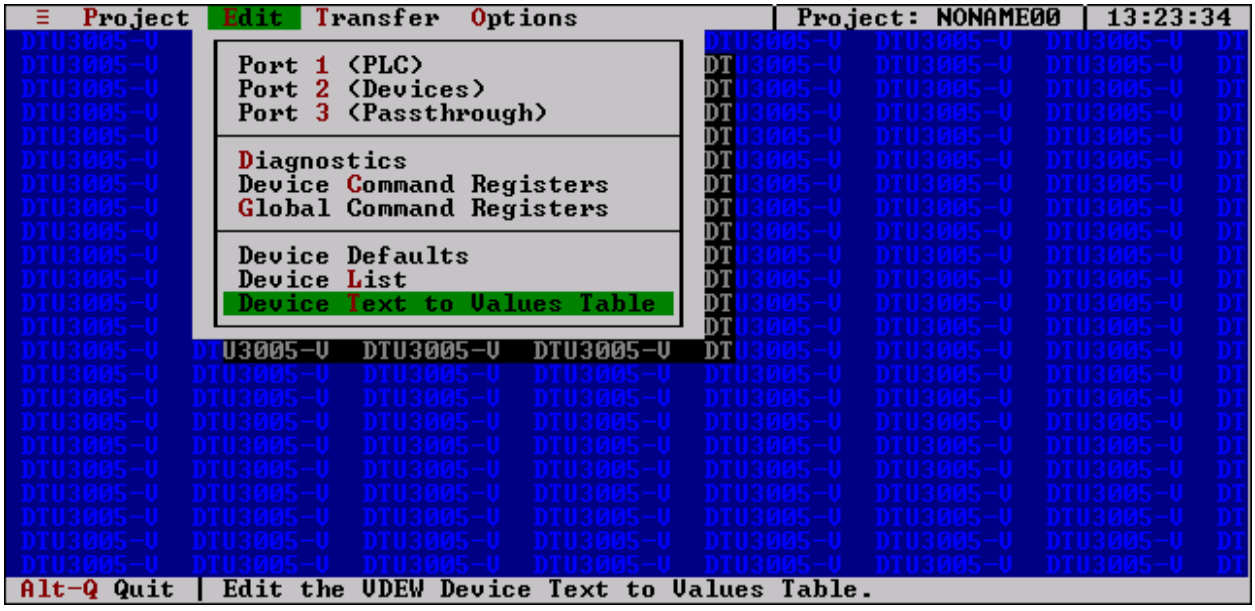
4. Select **Save** to save your configuration or **Revert** to restore the last previously saved configuration for that device. When you are finished configuring the default data registers for that device, select **Ok** to close this screen.

To conserve registers when using VDEW devices, you should set all unused registers to “Not Used” and place them at the end of the list. The DTU3005 will then only allocate registers for those containing device data. (This does not apply to SEAbus devices, for which the DTU3005 allocates 16 registers regardless if they are used or not.)

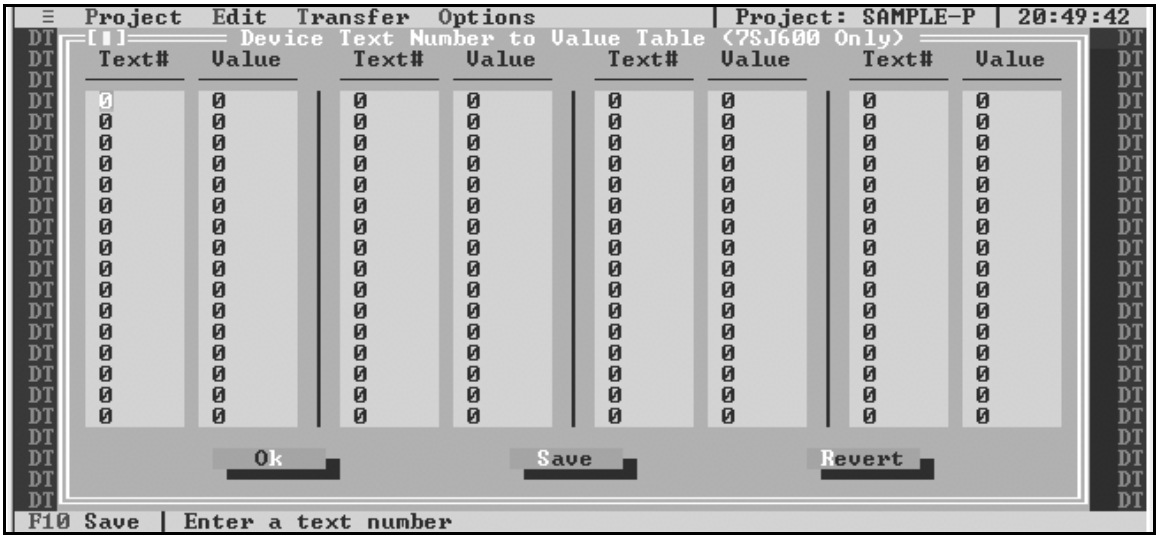
4.8 Device Text Setup (7SJ600 Only)

The Device Text to Values Table menu item is only available for configuring the 7SJ600 relay. It is used to convert status codes returned from select parameters in the 7SJ600 relay (only) to values in a format useful to the system connected to port 2 of the DTU3005. This affects the status readouts from the device's binary inputs, signal and trip rated contacts, and the LEDs.

To edit this table, select **Device Text to Values Table** from the **Edit** menu. This selection is only available when the device protocol for port 2 is set for “VDEW.”



Once open, 64 conversions can be defined. To define a conversion, enter the 7SJ600 relay status code in the **Text #** column and enter the corresponding output value desired in the **Value** column.



The relevant status codes (Text #) are listed below.

Table 4.1 7SJ600 Relay Information

For Requesting Status of the 7SJ600 Relay's Three Binary Inputs							
Text Number/Status Code (default value returned if not converted)	**Description of Returned Binary Input Status Codes: I1 indicates Input 1; I2,3 indicates Inputs 2 and 3**	**Suggested Value (Using This Conversion Table)**					
		Value	**Inputs**	**I3**	**I2**	**I1**	
		0	0	0	0	0	
1342	I1,2 Inactive : I3 Active	4	0	1	0	0	
1343	I1,3 Inactive : I2 Active	2	0	0	1	0	
1344	I1 Inactive : I2,3 Active	6	0	1	1	0	
1345	I2,3 Inactive : I1 Active	1	0	0	0	1	
1346	I2 Inactive : I1,3 Active	5	0	1	0	1	
1347	I3 Inactive : I1,2 Active	3	0	0	1	1	
1348	I1,2,3 Active	7	0	1	1	1	
For Requesting Status of the 7SJ600 Relay's Two Trip Contacts and Two Signal Contacts							
Text Number/Status Code (default value returned if not converted)	**Description of Returned Trip and Signal Relay Status Codes: S1,2 indicates Signal Relays 1 and 2; T1,2 indicates Trip Relays 1 and 2**	**Suggested Value (Using This Conversion Table)**					
		Value	**Outputs**	**S2**	**S1**	**T2**	**T1**
			Bits 15 . . . 4	**3**	**2**	**1**	**0**
1349	S1,2 T1,2 Open	0	0	0	0	0	0
1350	S1,2 T1 Open : T2 Closed	2	0	0	0	1	0
1351	S1,2 T2 open : T1 Closed	1	0	0	0	0	1
1352	S1,2 Open : T1,2 Closed	3	0	0	0	1	1
1353	S1 T1,2 Open : S2 Closed	8	0	1	0	0	0
1354	S1 T1 Open : S2 T2 Closed	10	0	1	0	1	0
1355	S1 T2 Open : S2 T1 Closed	9	0	1	0	0	1
1356	S1 Open : S2 T1,2 Closed	11	0	1	0	1	1
1357	S2 T1,2 Open : S1 Closed	4	0	0	1	0	0
1358	S2 T1 Open : S1 T2 Closed	6	0	0	1	1	0
1359	S2 T2 Open : S1 T1 Closed	5	0	0	1	0	1
1360	S2 Open : S1 T1,2 Closed	7	0	0	1	1	1
1361	T1,2 Open : S1,2 Closed	12	0	1	1	0	0
1362	T1 Open : S1,2 T2 Closed	14	0	1	1	1	0
1363	T2 Open : S1,2 T1 Closed	13	0	1	1	0	1
1364	S1,2 T1,2 Closed	15	0	1	1	1	1
For Requesting Status of the 7SJ600 Relay's Four Programmable LEDs							
Text Number/Status Code (default value returned if not converted)	**Description of Returned LED Status Codes: L1,2 indicates LEDs 1 and 2**	**Suggested Value (Using This Conversion Table)**					
		Value	**Outputs**	**L4**	**L3**	**L2**	**L1**
			Bits 15 . . . 4	**3**	**2**	**1**	**0**
1365	L1,2,3,4 Off	0	0	0	0	0	0
1366	L4 On : L1,2,3 Off	8	0	1	0	0	0
1367	L3 On : L1,2,4 Off	4	0	0	1	0	0
1368	L3,4 On : L1,2 Off	12	0	1	1	0	0
1369	L2 On : L1,3,4 Off	2	0	0	0	1	0
1370	L2,4 On : L1,3 Off	10	0	1	0	1	0
1371	L2,3 On : L1,4 Off	6	0	0	1	1	0

Table 4.1 7SJ600 Relay Information (Continued)

1372	L2,3,4 On : L1 Off	14	0	1	1	1	0
1373	L1 On : L2,3,4 Off	1	0	0	0	0	1
1374	L1,4 On : L2,3 Off	9	0	1	0	0	1
1375	L1,3 On : L2,4 Off	5	0	0	1	0	1
1376	L1,3,4 On : L2 Off	13	0	1	1	0	1
1377	L1,2 On : L3,4 Off	3	0	0	0	1	1
1378	L1,2,4 On : L3 Off	11	0	1	0	1	1
1379	L1,2,3 On : L4 Off	7	0	0	1	1	1
1380	L1,2,3,4 On	15	0	1	1	1	1

Once you are finished entering data, select **Save** to save your configuration, then select **Ok** to exit the dialog box. Select **Revert** to bring back the previous settings.

4.9 Global Command Registers

This option allows you to specify global commands for all the devices specified in the Device List. It is available only for VDEW devices.

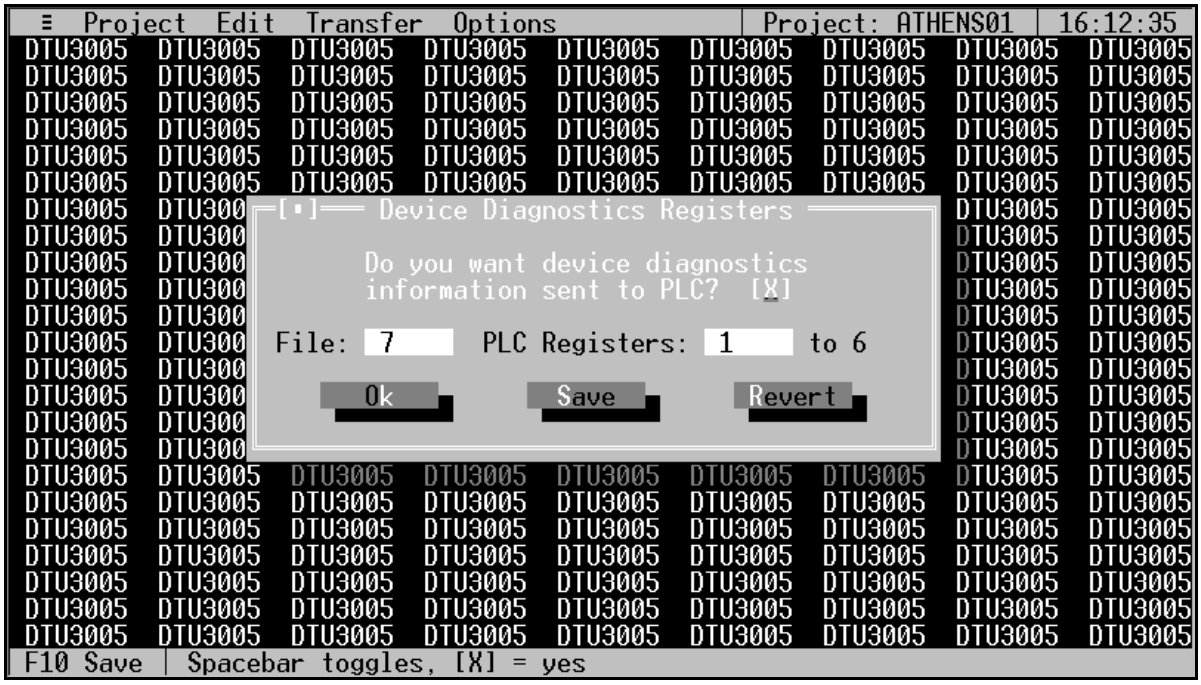
The Global Command Registers consist of six registers. These registers allow the PLC to transmit commands to all the devices in the Device List. To send a command, all the PLC needs to do is to place the command values into the appropriate PLC registers, which the DTU3005 unit reads and then processes.

4.10 Device Diagnostic Registers

This option programs the DTU3005 to send communications diagnostic information to a set of registers on the PLC. The information can be used to troubleshoot problems with the devices and the communications network.

The format and content of the diagnostic registers are described in detail in **Appendix F**.

1. To configure the device diagnostic registers, select **Diagnostics** from the **Edit** menu. The following screen displays:



2. To enable the sending of diagnostic information to the PLC, select the **Do you want device diagnostics information sent to PLC?** checkbox with the mouse or the **spacebar**. Then enter the starting register number in the **PLC Registers**: field. The register block is 6 bytes long. Be sure that the registers you specified are not being used by other devices.

3. Press **Shift+Tab**, or click the left mouse button to highlight the **File** field and enter the file number. This

parameter is used only with Allen-Bradley PLCs. It specifies the file number in the PLC that contains the register values that are transferred to or from the device.

4. Select **Save** to save the information to the project file, and then select **Ok** or press **Esc** to exit the device diagnostic registers screen. If at any time you want to return to the last saved version of the device diagnostics registers, select **Revert** without saving any changes.

4.11 Device Command Registers

The device command registers consist of two consecutive registers for each device entered in the device list. These registers allow the PLC to transmit commands to each of the devices. To send a command, all the PLC needs to do is to place the command values into the appropriate PLC registers, which the DTU3005B unit reads and then processes.

The first register contains the command, and the second register contains the data associated with the command. The format of the command registers for each device are described in **Appendix E**. All the command registers are placed in contiguous locations in the PLC's registers and are assigned by the DTU3005 to each device in the order that they are listed in the device list.

To use the command registers for a particular device, the PLC program must do the following, in order:

1. First, set the command word to 0 or -1 (FFFF hexadecimal).

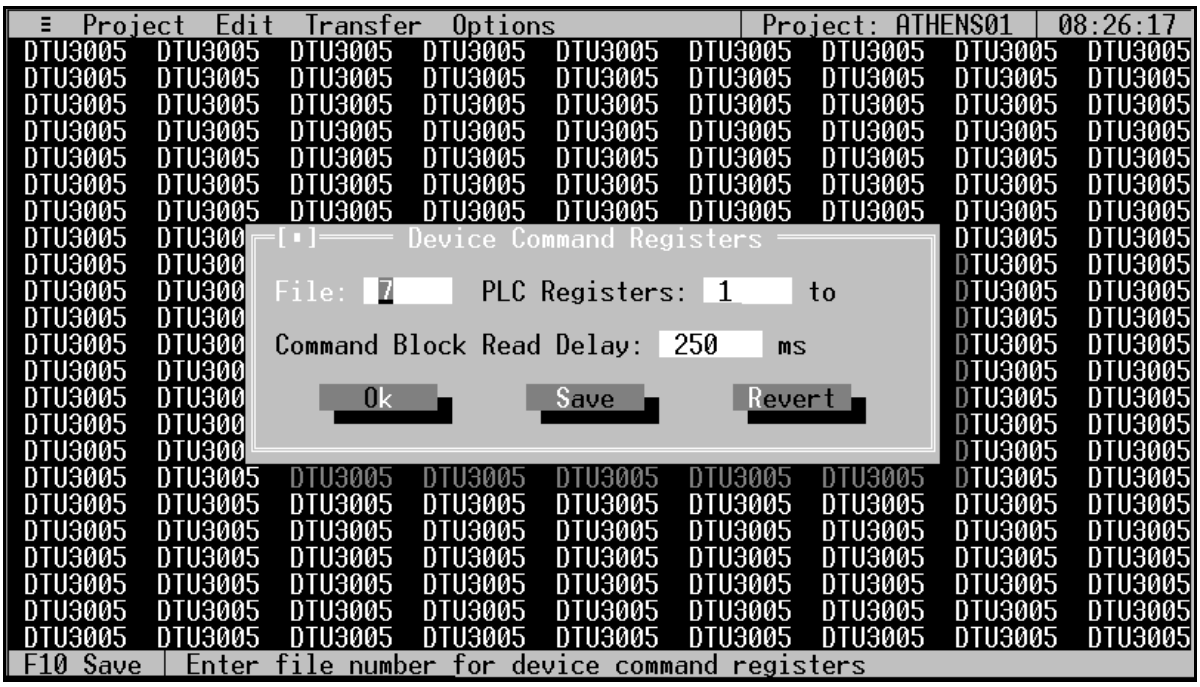
2. Set the data word to the appropriate value.

3. Set the command word to the appropriate value.

4. After the command is set the PLC must wait for the DTU3005B unit to change the command word to either 0 (to indicate successful processing of the command), or -1 (to indicate an error).

To indicate the location of the command registers on the PLC, follow these steps:

1. Select **Device Command Registers** from the **Edit** menu. The Device Command Registers screen appears:



2. Enter the starting register address in the **PLC Registers** field. The DTU3005 Editor software will determine the proper number of registers for the number of devices entered in the device list and indicate the final register number. These registers must be different from those used for device data and diagnostics. Refer to **Appendix A** for a list of valid register numbers for your PLC. Failure to use different register addresses will cause communication errors, and may cause unexpected operation of the devices.

3. Press **Shift+Tab**, or click the left mouse button to highlight the **File** field and enter the file number. This parameter is used only with Allen-Bradley PLCs to specify the file number in the PLC that contains the register values that are transferred to or from the device.

4. Enter the value for the **Command Block Read Delay**. This is the delay between times that the DTU3005 reads the data from the PLC's command registers. This controls the frequency that the registers are read to allow for critical PLC scan times.

5. Select **Save** to save the device information to the project file, and then select **Ok** or press **Esc** to exit the device command registers screen. If at any time you want to return to the last saved version of the device command registers, select **Revert** without saving any changes.

4.12 Saving the Project File

Now you have completed configuring the DTU3005 for PLC to device communications. Select **Save** from the **Project** menu and press **Enter**, or press **F10** to save the project file to disk. The next step is to transfer the project to the DTU3005 unit. This topic is covered in **Chapter 7**.

5 Creating Project Files—Modbus Master to Devices

This chapter covers configuration of the DTU3005 for Modbus master device communications with Siemens devices. Once you have created a Modbus Master to Devices project (see **Chapter 3**), follow the directions in this chapter to configure the project file. Then see **Chapter 7** for directions on downloading the project to the DTU3005.

5.1 Application Description

The Modbus Master to Devices application allows a Modbus master (usually a SCADA system) to control and monitor up to 32 SEAbus devices or Siemens protective relays. In this application, the DTU3005B acts as a slave, and all communications with the Modbus Master are initiated by the master device itself. The DTU3005B converts Modbus requests received into requests to access and control data on the Siemens devices. Registers are assigned for each device in the Holding Register range (40000 to 49999, where register 40001 is the first to be used). The Modbus Master accesses real-time data from the Siemens devices by reading these registers, and sends commands by writing to these registers. Refer to **Figure 5.1** for a matrix representation of these registers.

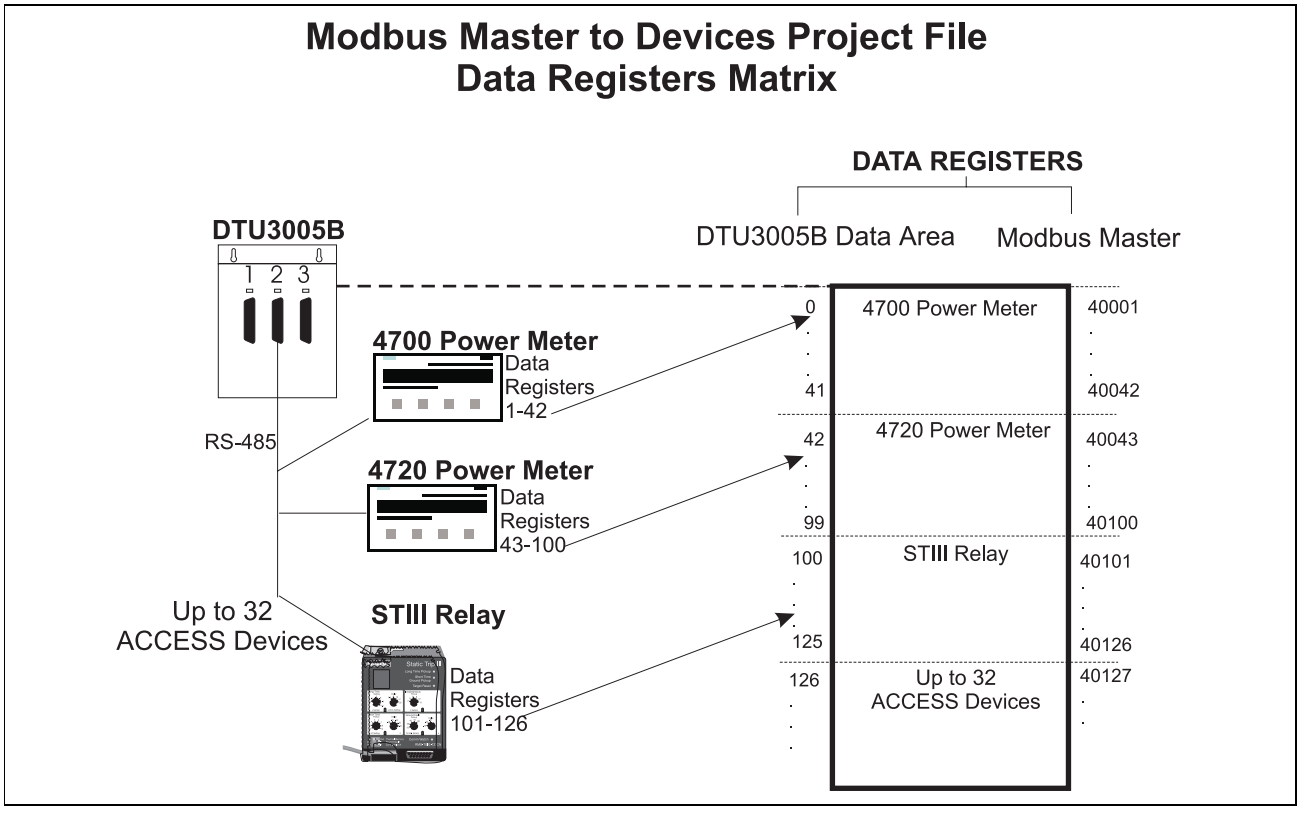
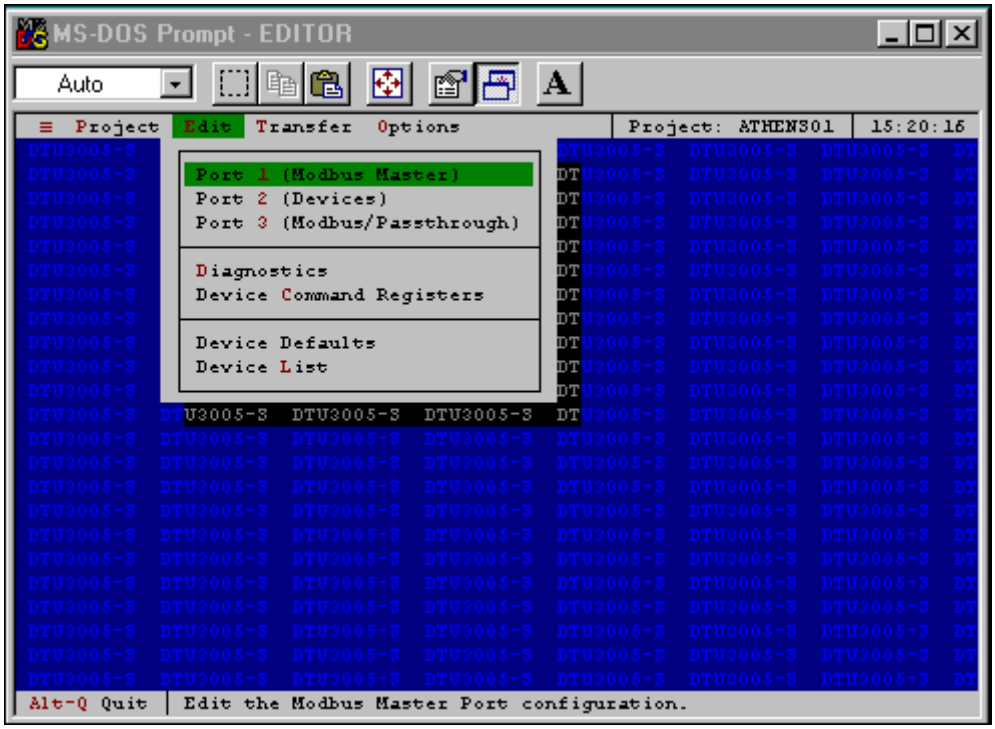


Figure 5.1 Modbus Master to Devices Project—Data Registers Matrix

5.2 Configuring the Project File

Once you have created or opened the project file, select **Edit** from the main menu. When the Device Protocol for port 2 is set to SEAbus (see **Section 5.4**), the following menu items appear:

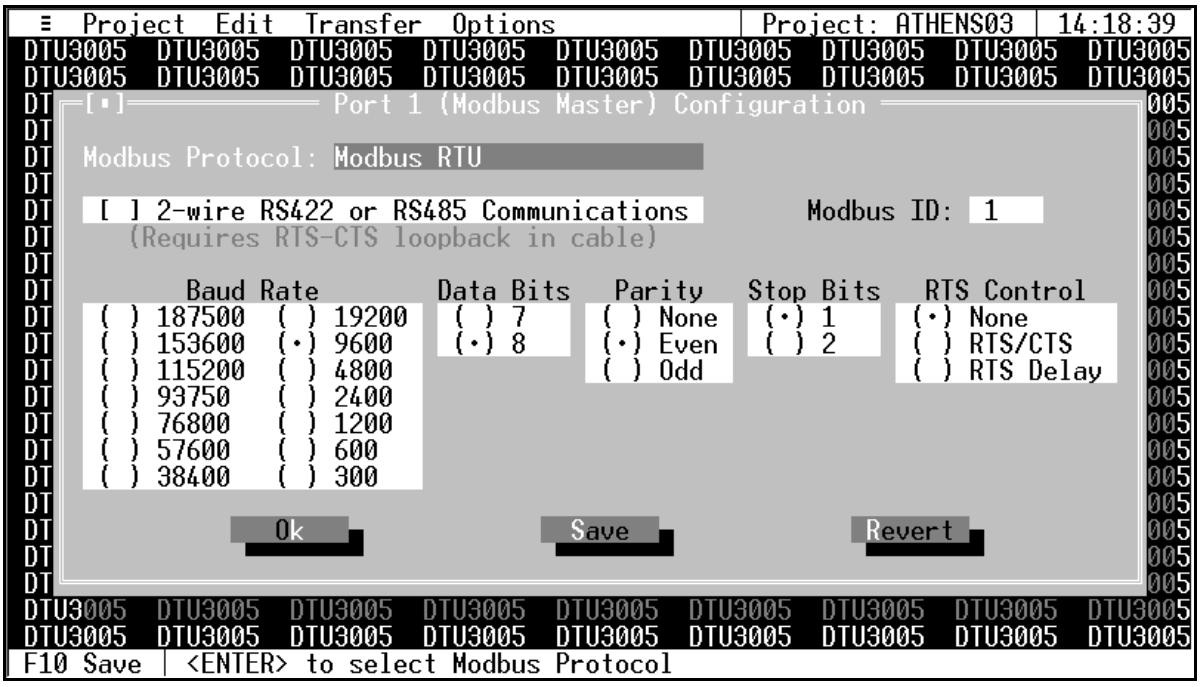
- **Port 1 (Modbus Master)**—allows you to select the protocol (RTU or ASCII) and configure the communications settings for the Modbus Master device connected to port 1.
- **Port 2 (Devices)**—allows you to configure communications settings for SEAbus devices or Siemens Protective relays connected to port 2.
- **Port 3 (Modbus/Passthrough)**—allows you to select whether port 3 is used as a passthrough to the devices on port 2, or used for connection to a second Modbus Master device.
- **Diagnostics**—allows you to indicate if you want the DTU3005 to write communications diagnostic information to the Modbus Master.
- **Device Command Registers**—allows you to indicate which PLC registers will be used for device commands.
- **Device Defaults**—allows you to set the default data registers for more than one device of a certain type, e.g., set the defaults for all 4720 power meters or all S7-I/O units. The data registers can still be customized for each device, as required. See **Section 5.7.2** for more information.
- **Device List**—allows you to indicate which SEAbus devices or Siemens protective relays are connected to port 2 and which PLC registers they are communicating with.



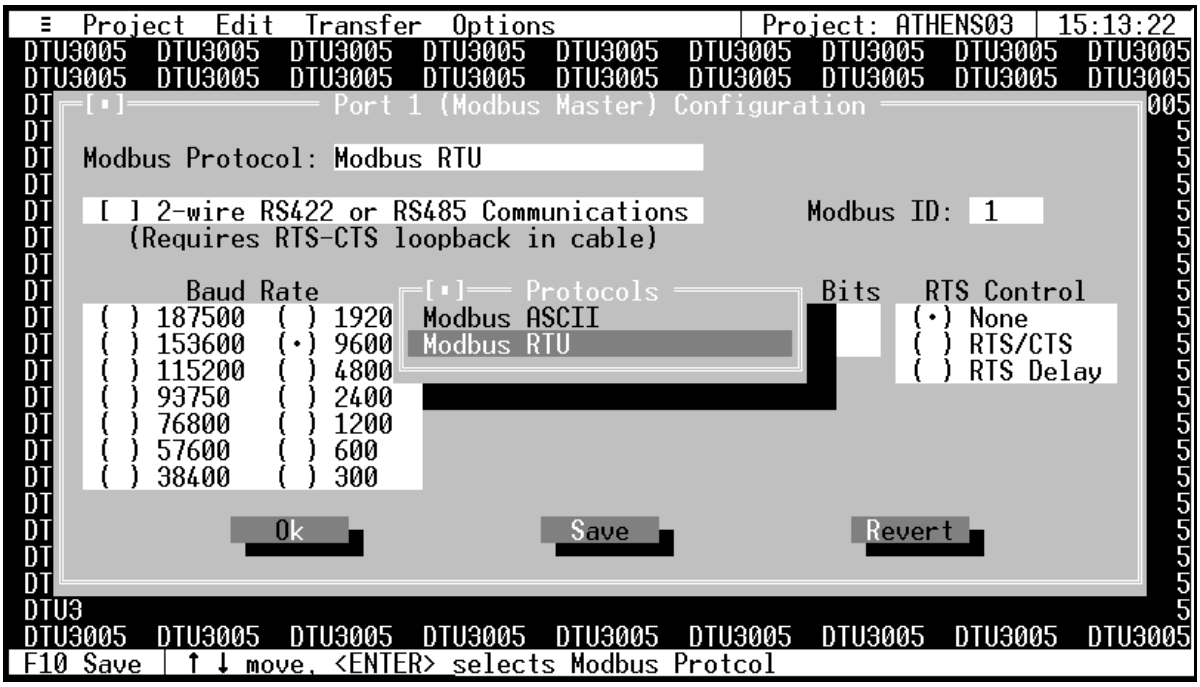
Note: If the Device Protocol for port 2 is set to VDEW (see **Section 5.4**), then two additional menu items are available: **Global Command Registers** and **Device Text to Values Table**. See **Section 5.8** and **Section** for instructions on using these menu items. In addition, the port 3 menu item is changed to **Port 3 (Modbus Master)** because the passthrough feature is not supported with VDEW devices. The instructions in **Section 5.3** are applicable to port 1 and to port 3 for VDEW devices.

5.3 Modbus Setup—Port 1

You must have a Modbus Master to Devices project file open to configure port 1 using the instructions in this section. Select **Port 1 (Modbus Master)** from the **Edit** menu, and the Port 1 Modbus Master configuration screen appears.



To select the protocol for the Modbus Master device connected to port 1, highlight **Modbus Protocol** and press **Enter**. The Modbus Master Protocol selection menu appears:



Select either ASCII or RTU as your Modbus protocol, then press the **Tab** key to highlight the **Modbus ID** selection box. The Modbus ID is used to identify the address of the DTU. Type in the Modbus ID number and press **Enter**.

2-Wire RS422 or RS485 Communications

After you have entered the Modbus ID number, highlight the **2-Wire RS422 or RS485 Communications** selection box. This box will only need to be checked if the communications with your Modbus Master device uses a 2-wire RS485 or RS422 interface (see **Figure 5.2**). When 2-wire communications are being used, RTS must be looped back to CTS on the DTU side of the cable. This can be done on the RS232 side by looping pins 4 and 5 or on the RS422/485 side by looping 16 to 18 and 17 to 19. See **Appendix D** for wiring diagrams for your particular PLC, and whether it uses a 2-wire connection.

To select the checkbox, click on it with the mouse or, with the **2-Wire RS422 or RS485 Communications** selection highlighted, press the **spacebar**. An "X" will appear inside the brackets when it is selected.

Press the **Tab** or **Right Arrow** key to move to the next field without selecting this checkbox.

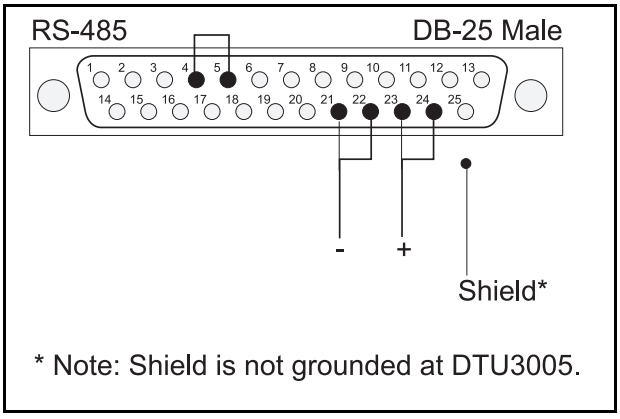


Figure 5.2 RS-485 Connector (two-wire)

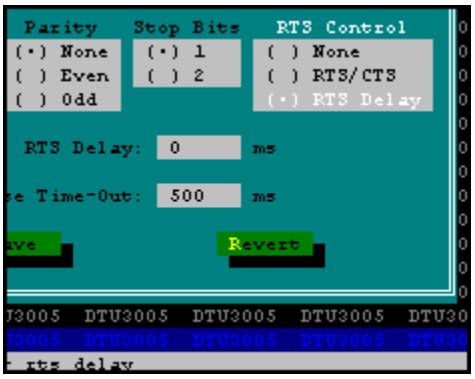
Communications Settings

Before changing any of these settings, consult your device manual for the correct settings. To move between the communications settings, press the **Tab** or **Enter** keys. To select a setting, use the **Up** or **Down Arrow** key to move to the desired setting and press the **spacebar** to change your selection.

RTS Control (Request to Send Control)

RTS Control selection is an option provided for modems or for Modbus Master devices that require RTS to be active only while the DTU is transmitting to the PLC.

- If **RTS/CTS** is selected, the DTU will activate RTS and wait until CTS is active before transmitting to the PLC.
- If **RTS Delay** is selected, the DTU will activate RTS and wait for the specified delay time to pass before transmitting to the PLC. When **RTS Delay** is selected, the program displays an entry box for the RTS delay time. Enter the time in milliseconds.



Response Time-Out

The **Response Time-Out** tells the DTU how long to wait after transmitting a request to the PLC if no response has been received from the PLC. After this amount of time passes with no response being received, the DTU will assume that no response is coming and will retry the request. Enter the time in milliseconds.

Saving Port 1 Configuration Information

Once you have entered all the configuration information, select **Save** to save the configuration to the project file. Then select **Ok** or press the **Esc** key to close the configuration screen.

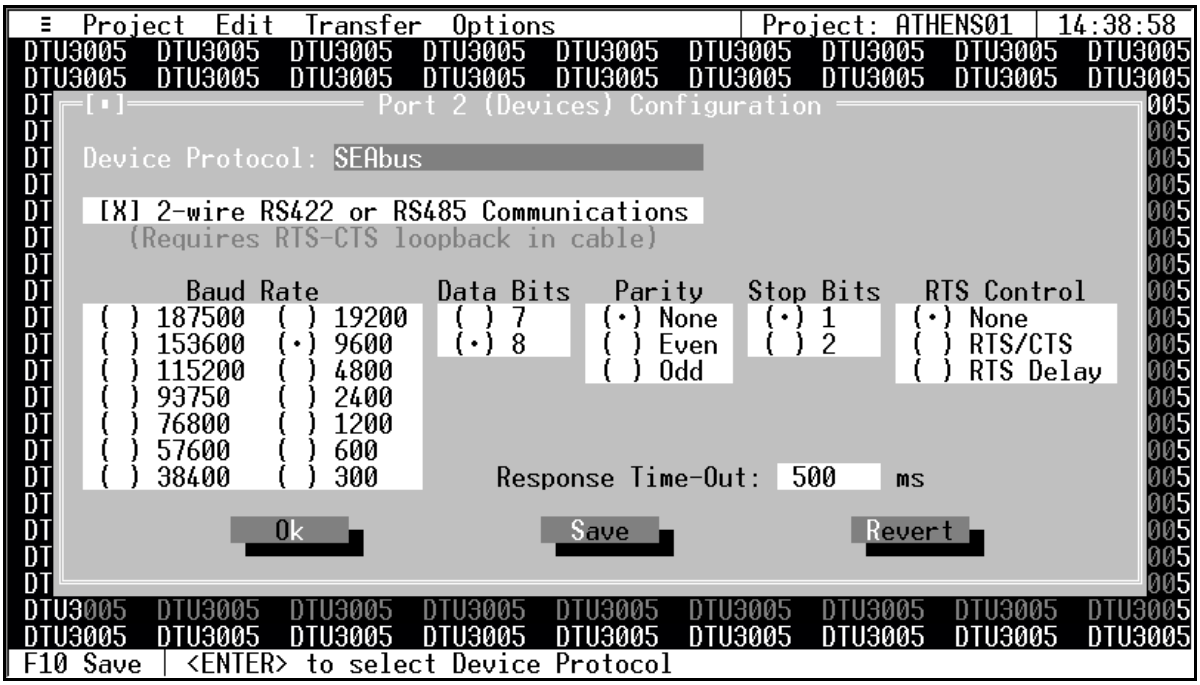
If you have changed the configuration and have not saved it to the project file, you will be prompted to either save or discard the changes.

Select **Revert** to return to the last previously saved configuration without saving any changes.

5.4 Device Setup—Port 2

One or more Siemens devices may be connected to port 2. You must have a Modbus Master to Devices project file open to configure port 2 using the instructions in this section.

Select **Port 2 (Devices)** from the **Edit** menu, and the Port 2 configuration screen appears.



Device Protocol

The **Device Protocol** indicates which Siemens devices can be connected to port 2. This protocol is based on which version of the DTU3005 Editor software was installed as described in **Chapter 2**.

- The **SEAbus** protocol (as shown in the example screen above) indicates connection to Siemens ACCESS communicating trip units, relays, power meters and other devices.
- The **VDEW** protocol indicates connection to Siemens protective relays using the VDEW protocol.

Note: Not all Siemens devices are supported. For a list of supported devices, see **Appendix B**.

Other Configuration Information

The remaining configuration selections are the same as those for port 1. Refer to **Section 5.3** for instructions on these fields.

Saving Port 2 Configuration Information

Once you have entered all the configuration information, select **Save** to save the configuration to the project file. Then select **Ok** or press the **Esc** key to close the configuration screen.

If you have changed the configuration and have not saved it to the project file, you will be prompted to either save or discard the changes.

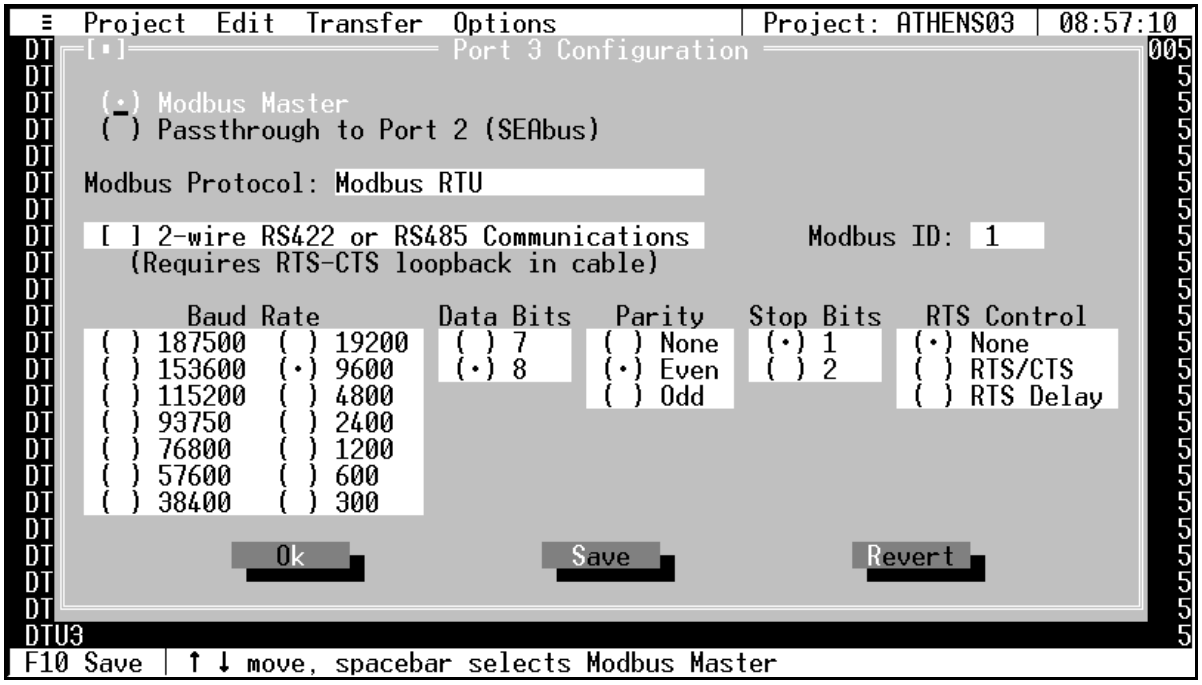
Select **Revert** to return to the last previously saved configuration without saving any changes.

5.5 Modbus/Passthrough Setup—Port 3

Port 3 can be used for passthrough communications to your Siemens SEAbus devices or for connection to a second Modbus Master device. Passthrough communications enables a PC running WinPM, or other supervisory software connected to port 3 of the DTU3005 to communicate directly with the SEAbus devices connected to port 2. In passthrough mode, any messages received on port 3 of the DTU are simply "passed through" to the devices.

Passthrough communications are not available for VDEW devices; see **Section 5.3** for **Port 3 (Modbus Master)** configuration of VDEW devices.

You must have a Modbus Master to Devices project file open to configure port 3 using the instructions in this section. Select **Port 3 (Modbus/Passthrough)** from the **Edit** menu, and the Port 3 configuration screen appears.



The first option on the configuration screen allows you to choose connection to a second Modbus Master device or passthrough to port 2. Select the appropriate configuration with the mouse, or use the **Up** or **Down Arrow** keys to highlight the selection and press the **spacebar**.

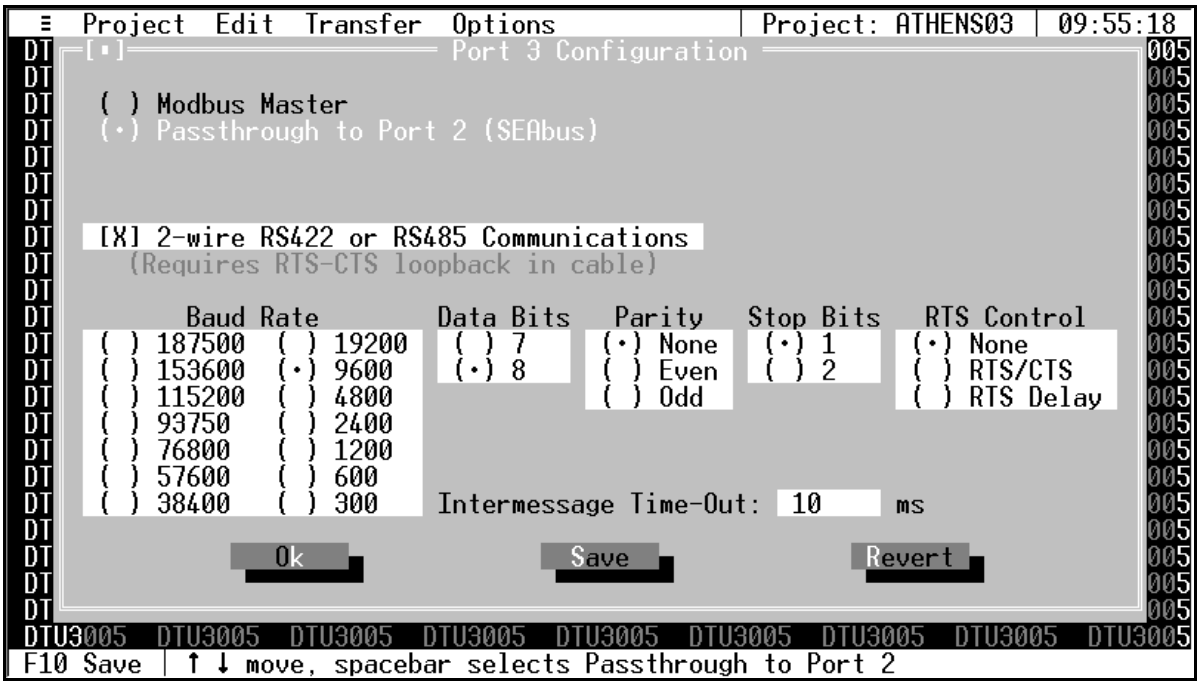
Modbus Master

If you select **Modbus Master**, the screen appears as shown above. Select the Modbus protocol by selecting the **Modbus Protocol** list box, highlighting either ASCII or RTU, and pressing **Enter**. After you have selected your protocol, press the **Tab** key to highlight the **Modbus ID** selection box. The Modbus ID is used to identify which Modbus Master device the DTU is to communicate with. Type in the Modbus ID number and press **Enter**.

The remaining configuration selections are for the communications parameters and have the same choices as those for port 1. Refer to **Section 5.3** for instructions on these fields.

Passthrough to Port 2 (SEAbus)

If you select **Passthrough to Port 2 (SEAbus)**, the screen appears as shown below.



2-Wire RS422 or RS485 Communications

After you have selected **Passthrough to Port 2 (SEAbus)**, press **Tab** or select **2-Wire RS422 or RS485 Communications**. This box will only need to be checked if the communications with your SEAbus devices use a 2-wire RS485 or RS422 interface. This is the usual method of connecting SEAbus devices. When 2-wire communications are being used, RTS must be looped back to CTS on the DTU side of the cable. This can be done on the RS232 side by looping pins 4 and 5 or on the RS422/485 side by looping 16 to 18 and 17 to 19. See **Appendix D** for wiring diagrams for your particular PLC, and whether it uses a 2-wire connection.

To select the checkbox, click on it with the mouse or, with the **2-Wire RS422 or RS485 Communications** selection highlighted, press the **spacebar**. An "X" will appear inside the brackets when it is selected.

Press the **Tab** or **Right Arrow** key to move to the next field without selecting this checkbox.

Intermessage Time-Out

The DTU3005 uses the intermessage time-out to determine when a complete message has been received on the passthrough port. Once the first character of a message has been received, if the amount of time specified by the intermessage time-out passes with no additional characters being received, the DTU3005 will consider the message to be complete and process it.

To change the intermessage time-out, select **Intermessage Time-Out** and enter the value in milliseconds, then press **Enter**.

Saving Port 3 Configuration Information

Once you have entered all the configuration information, select **Save** to save the configuration to the project file. Then select **Ok** or press the **Esc** key to close the configuration screen.

If you have changed the configuration and have not saved it to the project file, you will be prompted to either save or discard the changes.

Select **Revert** to return to the last previously saved configuration without saving any changes.

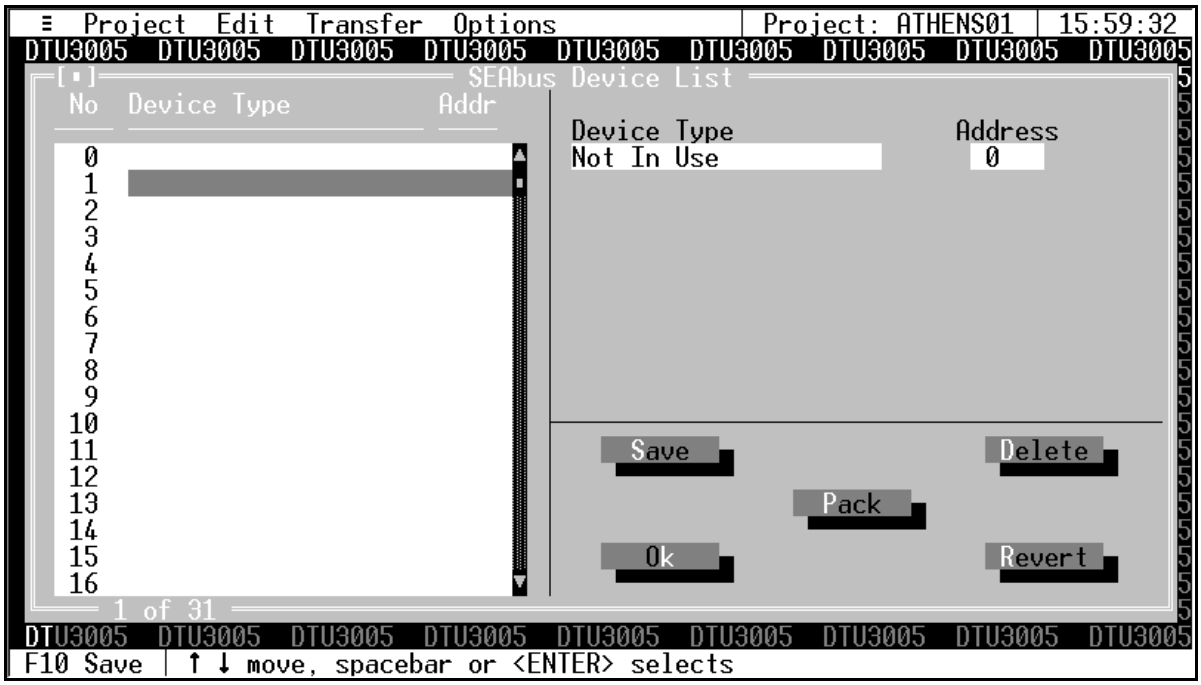
Other Configuration Information

The remaining configuration selections are the same as those for port 1. Refer to **Section 5.3** for instructions on these fields.

5.6 Device List Setup

The device list menu item enables you to indicate which registers on the PLC will receive data from the devices. In this menu, you will enter the device type and address for each Siemens device connected to port 2. You will also indicate to which registers on the PLC you want the DTU3005 to write device data.

Select **Device List** from the **Edit** menu to display the device list screen:



This screen is divided into two parts:

- On the left side of the screen is a list of the devices connected to port 2 (the list is initially empty). Up to 32 devices can be attached; however, only 17 of the devices are visible on the screen at one time. To see all the devices, click on the scroll bar with the mouse, or use the **Up** and **Down Arrow** and **Page Up** and **Page Down** keys.

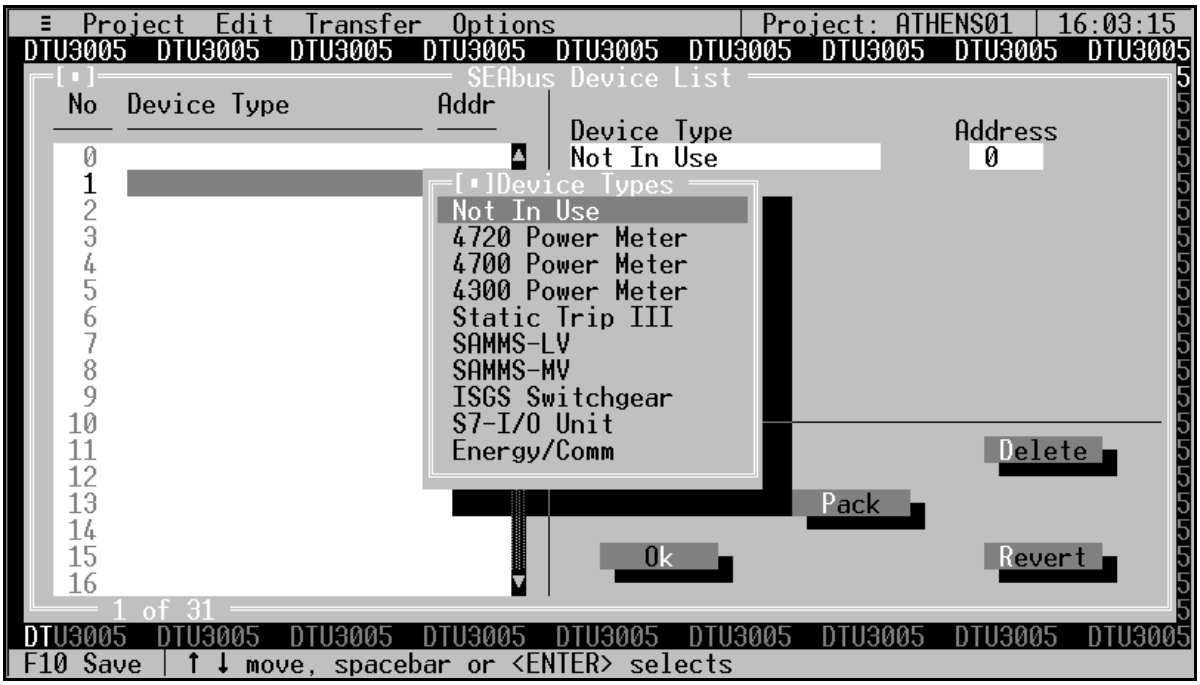
- The right side of the screen is used to configure the data register information for the selected device, as shown in the example screen on the next page. You can add or delete devices, or change device configuration by highlighting the **Device Type** on the left side of the screen, then using the fields and buttons on the right side of the screen.

Adding a Device

To add a device to the device list:

1. Highlight the first line where the **Device Type** and **Address** fields are blank—this should be the first available device number **No** field.

2. Press **Enter** or **Tab** to add a device. The cursor will move to the **Device Type** field on the right side of the screen. Press **Enter**, and the **Device Types** list displays:



3. Select the device from the list by pressing **Enter** or the **spacebar**. The highlight moves to the **Address** field, and the PLC register fields now display as shown in the example screen below.

4. With the **Address** field highlighted, enter the device's address. This number should be between 1 and 254, and match the number programmed into the device itself. Press the **Tab** key twice to go to the **Real-Time Data Registers** field.

5. Enter the beginning register number in the **Real-Time Data Registers** field. Refer to **Appendix A** for valid register numbers for your PLC application. The DTU3005 Editor software supplies the last register number after you enter the first. In the example above, the 4700 Power Meter uses 41 registers for its data. When you enter 1 for the first register, the last register becomes 42. If you

change the starting register to 10, the last register will automatically change to 51.

Note: The Modbus Master must read these register numbers to be able to access the real-time data for this device.

6. Press **Shift+Tab**, or click the left mouse button to highlight the **File** field and enter the file number. This parameter is used only with Allen-Bradley PLCs to specify the file number in the PLC that contains the register values that are transferred to or from the device.

7. The device command registers are displayed below the real-time data registers. They are configured from the **Device Command Registers** menu selection on the **Edit** menu. See **Section 5.11** for information on setting these registers and programming the PLC to perform commands. Be sure that the register numbers are not also used by the device. This can cause unexpected operation of the device.

8. If you want to use a customized subset of the available data registers, see **Section 5.7.2** for instructions on creating a default set of custom registers for all devices of the same type. Type an "X" in the **Use customized real-time data ordering?** field to begin the custom data setup, or press **Tab** to go to the next field.

9. Enter the **Real-Time Data Delay Time** in its field. This is the delay from the time that the DTU3005 receives data from the device to the time the DTU3005 transfers the data to the PLCs registers.

10. Select **Save** to save the device information to the project file, and then select **Ok** or press **Esc** to exit the device list configuration screen. If at any time you want to return to the last saved version of the device list, select **Revert** without saving any changes.

Removing a Device

To remove a device from the device list, highlight the device on the left side of the screen and press **Tab** or **Enter**. Then change the device type to **Not In Use**.

Additional Options for Data Registers

The Device List screen has three additional options for working with a device's data registers:

- Select **Set Reg** to place the data registers into contiguous register numbers and minimize the size to the data register block. This option also sets the initial register number to 1.

- The **Set All** command performs the same function but allows you to set the initial register number. See **Appendix A** for information on acceptable register number ranges for each PLC model.

- Select **Pack** to minimize the size of the command register block, removing registers for deleted devices.

Saving the Device List Configuration

Once you have entered the device information for all the devices attached to port 2, select **Save** to save the device information to the project file. Then select **Ok** or press **Esc** to close the device list configuration screen.

If you have changed the device information and have not saved it to the project file, you will be prompted to either save or discard the changes.

Select **Revert** to return to the last previously saved configuration without saving any changes.

5.7 Configuring Custom Device Registers

You can configure which data items from the SEAbus or VDEW devices are transferred from the DTU3005 device to the PLC or Modbus master. In this way, the DTU3005 acts as a data concentrator, in addition to converting the SEAbus and VDEW protocol data. You can configure the custom data items so that every device of the same type sends the same data items (see **Section 5.7.2**), or have each device send particular data items of interest (see **Section 5.7.1**). SEAbus devices can be configured to send 16 words of device data. VDEW devices can be configured to send from 1 to 64 words.

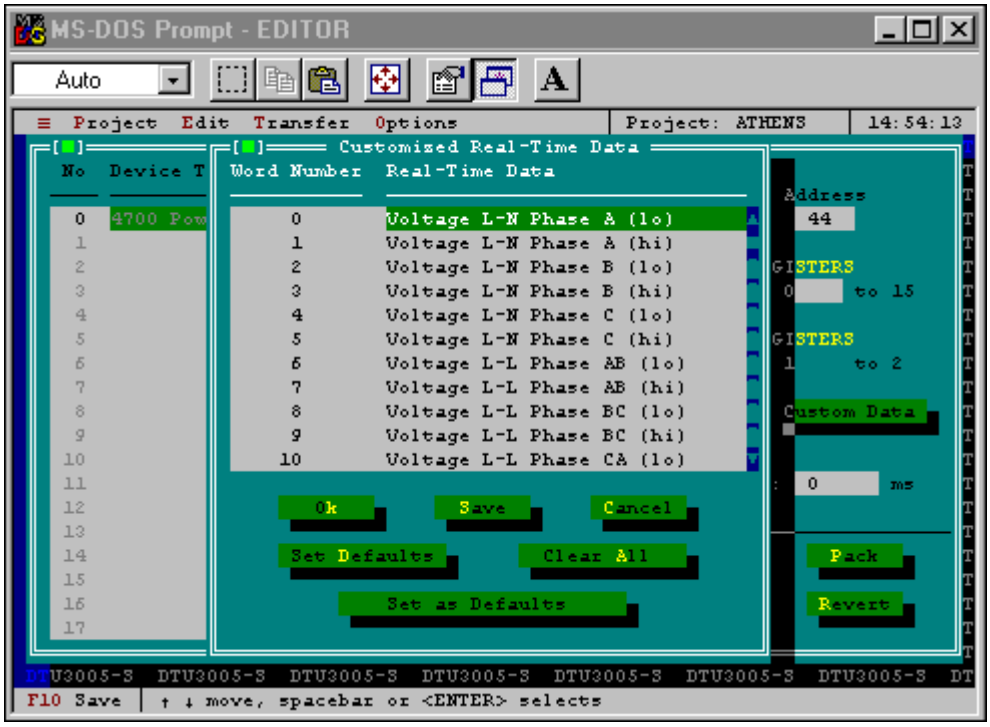
5.7.1 Configuring Custom Registers for a Single Device

To configure custom registers for a single device:

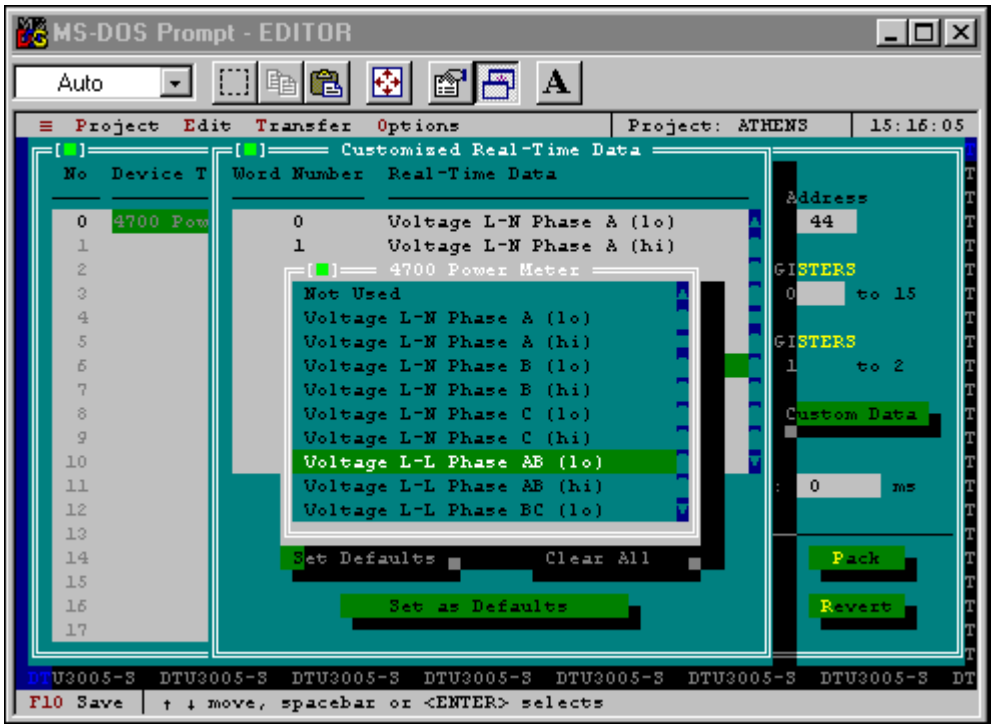
1. Select **Device List** from the **Edit** menu.

2. Highlight the device that you wish to configure and press **Enter**.

3. Highlight the **Use customized real-time data ordering?** check box. Press the **spacebar** to place an "X" in the check box. Then select **Custom Data** to display the Customized Real-Time Data dialog box.



4. Select a data register on the list and press **Enter** to see a list of available real time data. The data items are identical to the standard data items listed in **Appendix E**. Not all data items are visible on the screen at one time. Use the mouse and the scroll bar, or the **Page Up** and **Page Down** keys to view all of the data items.



5. Select the data word (16 bit data) from the list and press **Enter**. Continue to set the other data words in the same manner. Many data items consist of two words (32 bit data). It is important that you configure both words in order to transmit useful information to the DTU3005's registers.

6. Use these options as follows:

   a. Select **Set Defaults** to copy the default custom device registers to the list. See **Section 5.7.2** for instructions on setting custom device registers by device type.

   b. Select **Clear All** to delete all register names from the list.

   c. Select **Set as Defaults** to save the current custom register list as the default custom register list. This will not change the custom registers of other devices of the same type. See **Section 5.7.1** for instructions on setting custom device registers for a single device.

4. Select **Save** to save your custom register list and then **Ok** to exit this dialog box. Select **Cancel** to exit this dialog box without making changes.

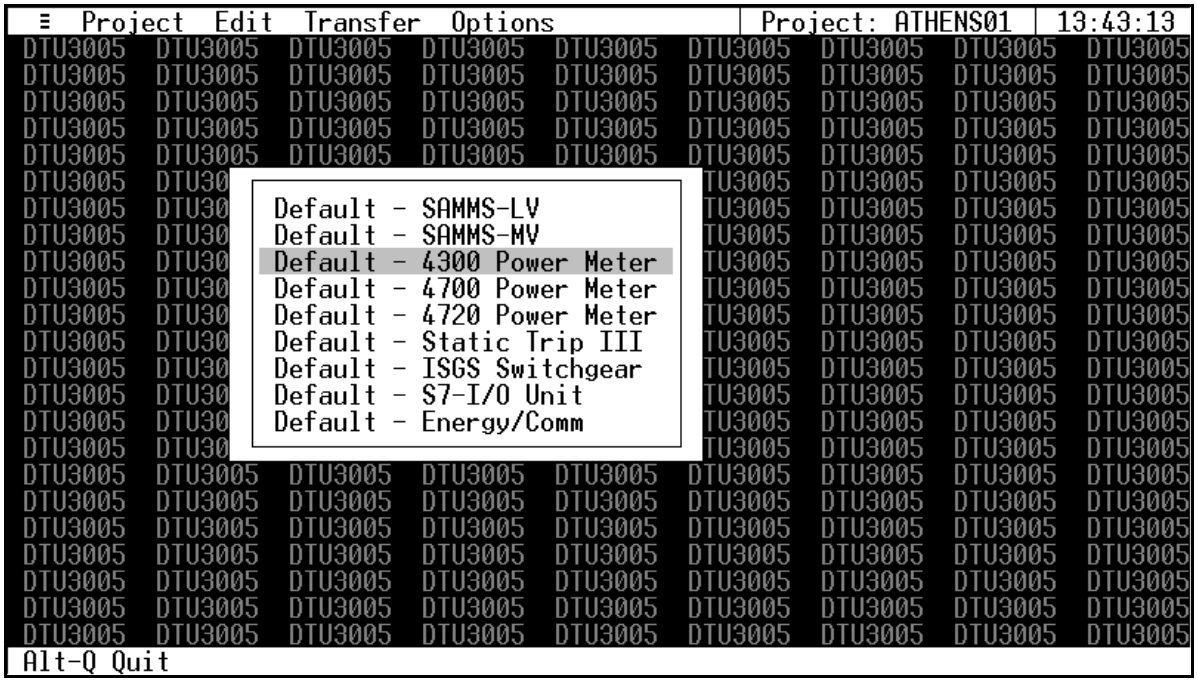
To conserve registers when using VDEW devices, you should set all unused registers to "Not Used" and place them at the end of the list. The DTU3005 will only allocate registers for those containing device data. (This does not apply to SEAbus devices, for which the DTU3005 allocates 16 registers regardless if they are used or not.)

5.7.2 Configuring Default Custom Device Registers

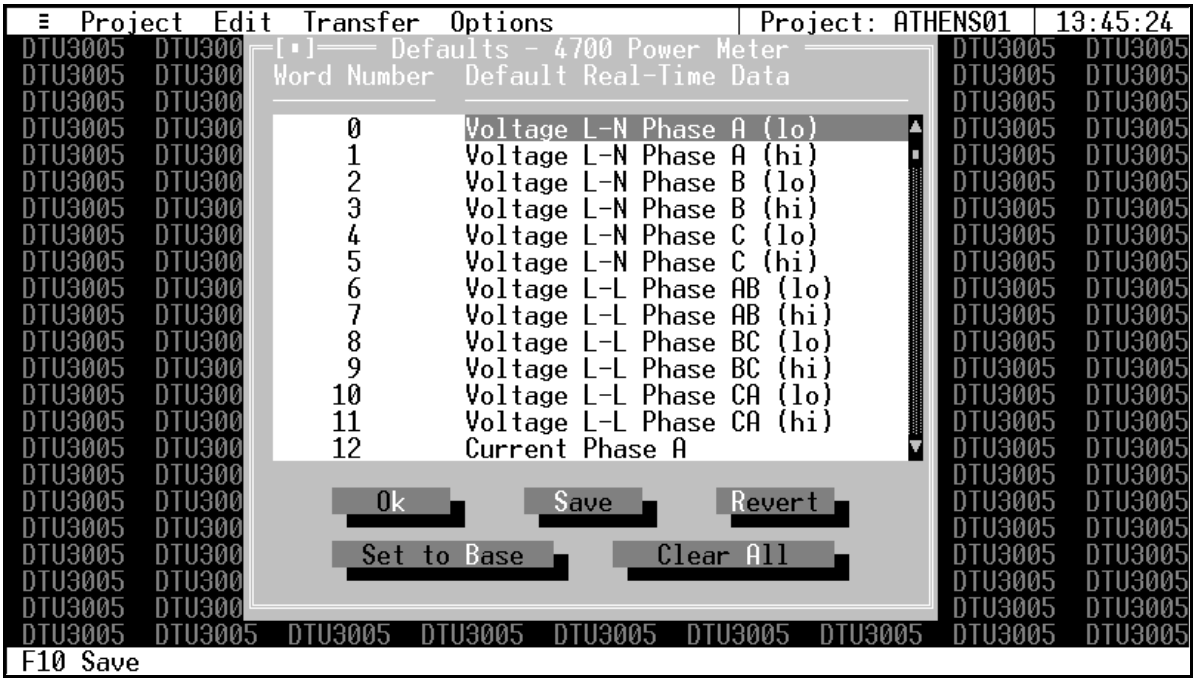
If you are configuring custom device registers for more than one device of a certain type, you may configure the default custom registers from the Edit menu **Device Defaults** command. After configuring the default device registers, you may use them for any or all devices, or further customize individual registers for any of your devices. SEAbus devices can have 16 custom registers. VDEW devices may have between 1 and 64 custom registers.

To configure default custom registers for a particular device type:

1. Select **Device Defaults** from the **Edit** menu. A list of devices appears. If you have configured port 2 for SEAbus devices, only SEAbus devices will



2. Select the device you wish to configure. The default custom register configuration menu appears. The first time you select this command, the first 16 registers (64 for VDEW devices) from the device's standard data register list appear on the default real-time data list. Not all of the entries are visible on the menu. Use the scroll bar or the **Page Up** and **Page Down** keys to view all the entries.



3. Select a data item and press **Enter** to see a list of device data items that can be assigned to that data word. Select **Not Used** if you do not want that data word to be used. Not all of the entries are visible on the menu. Use the scroll bar or the **Page Up** and **Page Down** keys to view all the entries. Select **Clear All** to set all data words to "Not Used." Select **Set to Base** to restore the data words to the first 16 registers (64 for VDEW devices) from the device's standard data register list.

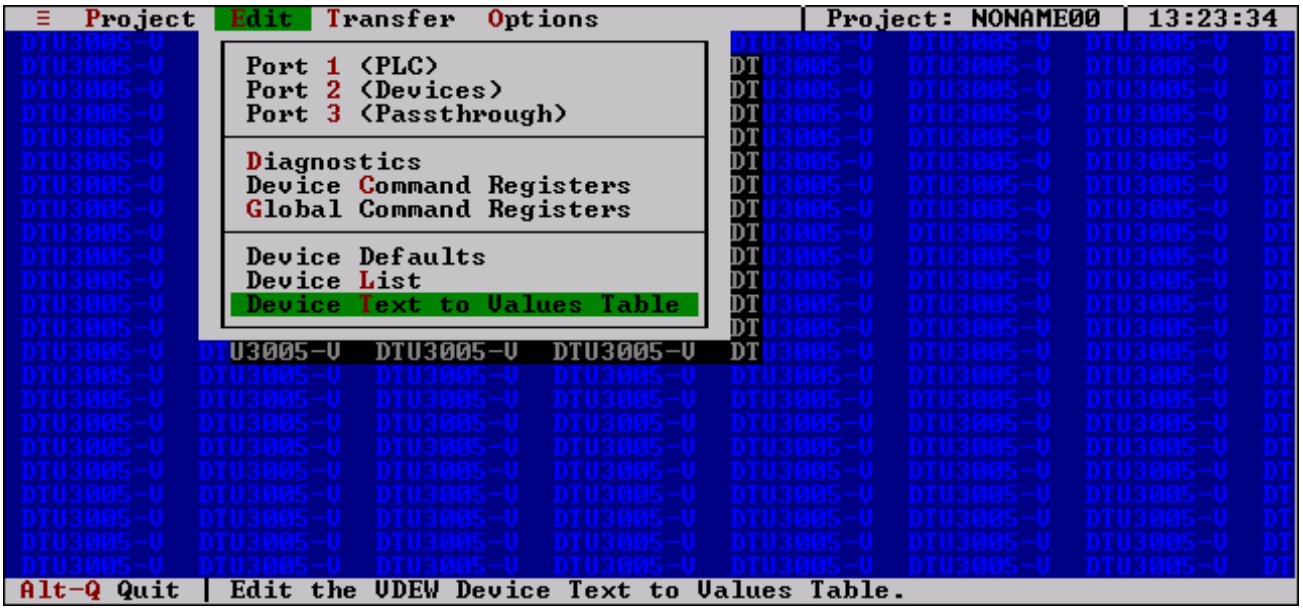
4. Select **Save** to save your configuration or **Revert** to restore the last previously saved configuration for that device. When you are finished configuring the default data registers for that device, select **Ok** to close this screen.

To conserve registers when using VDEW devices, you should set all unused registers to "Not Used" and place them at the end of the list. The DTU3005 will only allocate registers for those containing device data. (This does not apply to SEAbus devices, for which the DTU3005 allocates 16 registers regardless if they are used or not.)

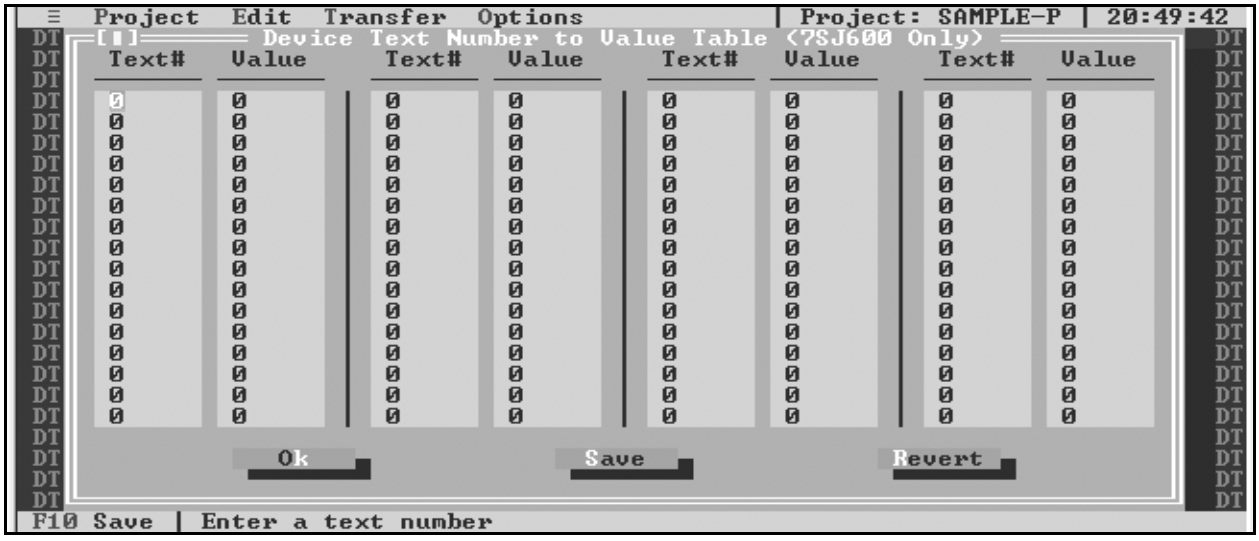
5.8 Device Text Setup (7SJ600 Only)

The Device Text to Values Table menu item is only available for configuring the 7SJ600 relay. It is used to convert status codes returned from select parameters in the 7SJ600 relay (only) to values in a format useful to the system connected to port 2 of the DTU3005. This affects the status readouts from the device's binary inputs, signal and trip rated contacts, and the LEDs.

To edit this table, select **Device Text to Values Table** from the **Edit** menu. This selection is only available when the device protocol for port 2 is set for "VDEW."



Once open, 64 conversions can be defined. To define a conversion, enter the 7SJ600 relay status code in the **Text #** column and enter the corresponding output value desired in the **Value** column.



The relevant status codes (Text #) are listed below.

Table 5.1 7SJ600 Relay Information

For Requesting Status of the 7SJ600 Relay's Three Binary Inputs							
Text Number/Status Code (default value returned if not converted)	**Description of Returned Binary Input Status Codes: I1 indicates Input 1; I2,3 indicates Inputs 2 and 3**	**Suggested Value (Using This Conversion Table)**					
		Value	**Inputs**	**I3**	**I2**	**I1**	
		0	0	0	0	0	
1342	I1,2 Inactive : I3 Active	4	0	1	0	0	
1343	I1,3 Inactive : I2 Active	2	0	0	1	0	
1344	I1 Inactive : I2,3 Active	6	0	1	1	0	
1345	I2,3 Inactive : I1 Active	1	0	0	0	1	
1346	I2 Inactive : I1,3 Active	5	0	1	0	1	
1347	I3 Inactive : I1,2 Active	3	0	0	1	1	
1348	I1,2,3 Active	7	0	1	1	1	
For Requesting Status of the 7SJ600 Relay's Two Trip Contacts and Two Signal Contacts							
Text Number/Status Code (default value returned if not converted)	**Description of Returned Trip and Signal Relay Status Codes: S1,2 indicates Signal Relays 1 and 2; T1,2 indicates Trip Relays 1 and 2**	**Suggested Value (Using This Conversion Table)**					
		Value	**Outputs**	**S2**	**S1**	**T2**	**T1**
			Bits 15 . . . 4	**3**	**2**	**1**	**0**
1349	S1,2 T1,2 Open	0	0	0	0	0	0
1350	S1,2 T1 Open : T2 Closed	2	0	0	0	1	0
1351	S1,2 T2 open : T1 Closed	1	0	0	0	0	1
1352	S1,2 Open : T1,2 Closed	3	0	0	0	1	1
1353	S1 T1,2 Open : S2 Closed	8	0	1	0	0	0
1354	S1 T1 Open : S2 T2 Closed	10	0	1	0	1	0
1355	S1 T2 Open : S2 T1 Closed	9	0	1	0	0	1
1356	S1 Open : S2 T1,2 Closed	11	0	1	0	1	1
1357	S2 T1,2 Open : S1 Closed	4	0	0	1	0	0
1358	S2 T1 Open : S1 T2 Closed	6	0	0	1	1	0
1359	S2 T2 Open : S1 T1 Closed	5	0	0	1	0	1
1360	S2 Open : S1 T1,2 Closed	7	0	0	1	1	1
1361	T1,2 Open : S1,2 Closed	12	0	1	1	0	0
1362	T1 Open : S1,2 T2 Closed	14	0	1	1	1	0
1363	T2 Open : S1,2 T1 Closed	13	0	1	1	0	1
1364	S1,2 T1,2 Closed	15	0	1	1	1	1
For Requesting Status of the 7SJ600 Relay's Four Programmable LEDs							
Text Number/Status Code (default value returned if not converted)	**Description of Returned LED Status Codes: L1,2 indicates LEDs 1 and 2**	**Suggested Value (Using This Conversion Table)**					
		Value	**Outputs**	**L4**	**L3**	**L2**	**L1**
			Bits 15 . . . 4	**3**	**2**	**1**	**0**
1365	L1,2,3,4 Off	0	0	0	0	0	0
1366	L4 On : L1,2,3 Off	8	0	1	0	0	0
1367	L3 On : L1,2,4 Off	4	0	0	1	0	0
1368	L3,4 On : L1,2 Off	12	0	1	1	0	0
1369	L2 On : L1,3,4 Off	2	0	0	0	1	0
1370	L2,4 On : L1,3 Off	10	0	1	0	1	0
1371	L2,3 On : L1,4 Off	6	0	0	1	1	0

Table 5.1 7SJ600 Relay Information (Continued)

1372	L2,3,4 On : L1 Off	14	0	1	1	1	0
1373	L1 On : L2,3,4 Off	1	0	0	0	0	1
1374	L1,4 On : L2,3 Off	9	0	1	0	0	1
1375	L1,3 On : L2,4 Off	5	0	0	1	0	1
1376	L1,3,4 On : L2 Off	13	0	1	1	0	1
1377	L1,2 On : L3,4 Off	3	0	0	0	1	1
1378	L1,2,4 On : L3 Off	11	0	1	0	1	1
1379	L1,2,3 On : L4 Off	7	0	0	1	1	1
1380	L1,2,3,4 On	15	0	1	1	1	1

Once you are finished entering data, select **Save** to save your configuration, then select **Ok** to exit the dialog box. Select **Revert** to bring back the previous settings.

5.9 Global Command Registers

This option allows you to specify global commands for all the devices specified in the Device List. It is only available for VDEW devices.

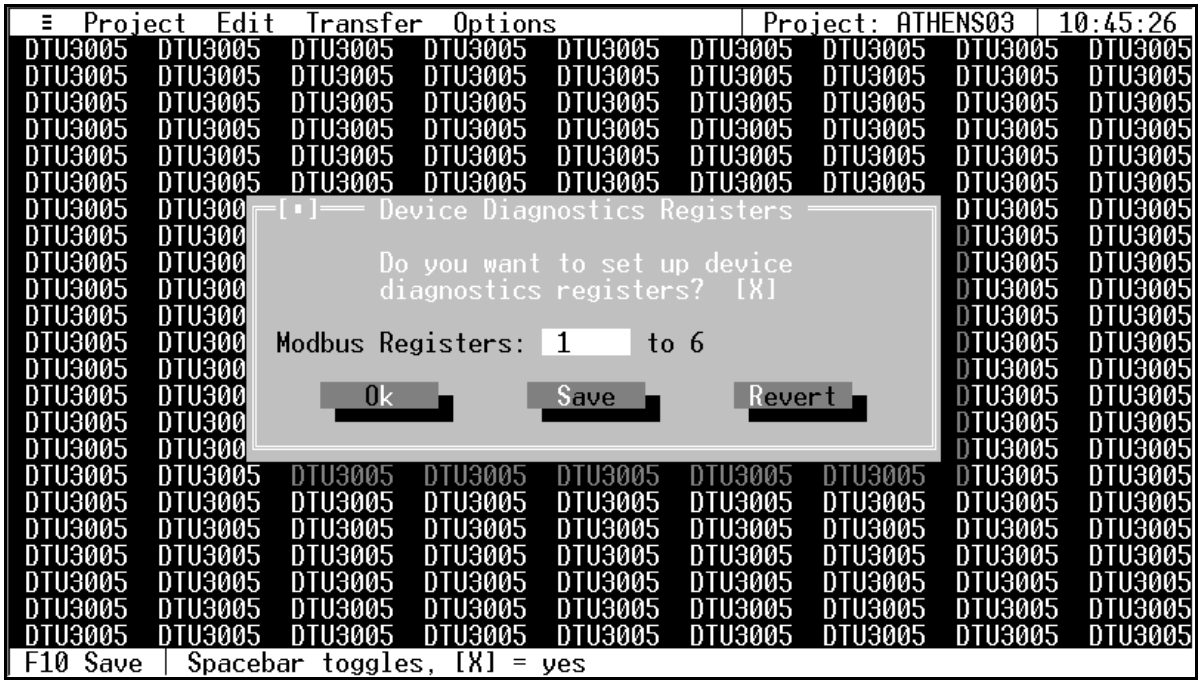
The Global Command Registers consist of six registers. These registers allow the PLC to transmit commands to all the devices in the Device List. To send a command, all the PLC needs to do is to place the command values into the appropriate PLC registers, which the DTU3005 unit reads and then processes.

5.10 Device Diagnostic Registers

This option programs the DTU3005 to send communications diagnostic information to a set of registers that can be read by the Modbus Master device. This option allows the Modbus Master to collect diagnostic information by reading the registers assigned here. The information can be used to troubleshoot problems with the devices and the communications network.

The format and content of the diagnostic registers are described in detail in **Appendix F**.

1. To configure the device diagnostic registers, select **Diagnostics** from the **Edit** menu. The following screen displays:



2. To enable the sending of diagnostic information to the Modbus Master, select the **Do you want to set up device diagnostics registers?** checkbox with the mouse or the **spacebar**. Then enter the starting register number in the **Modbus Registers**: field. The register block is 6 bytes long. These are written to the holding register area (40000 to 49999). Thus entering a 1 in this field represents

register 40001, etc. Be sure that the registers you specified are not being used by other devices.

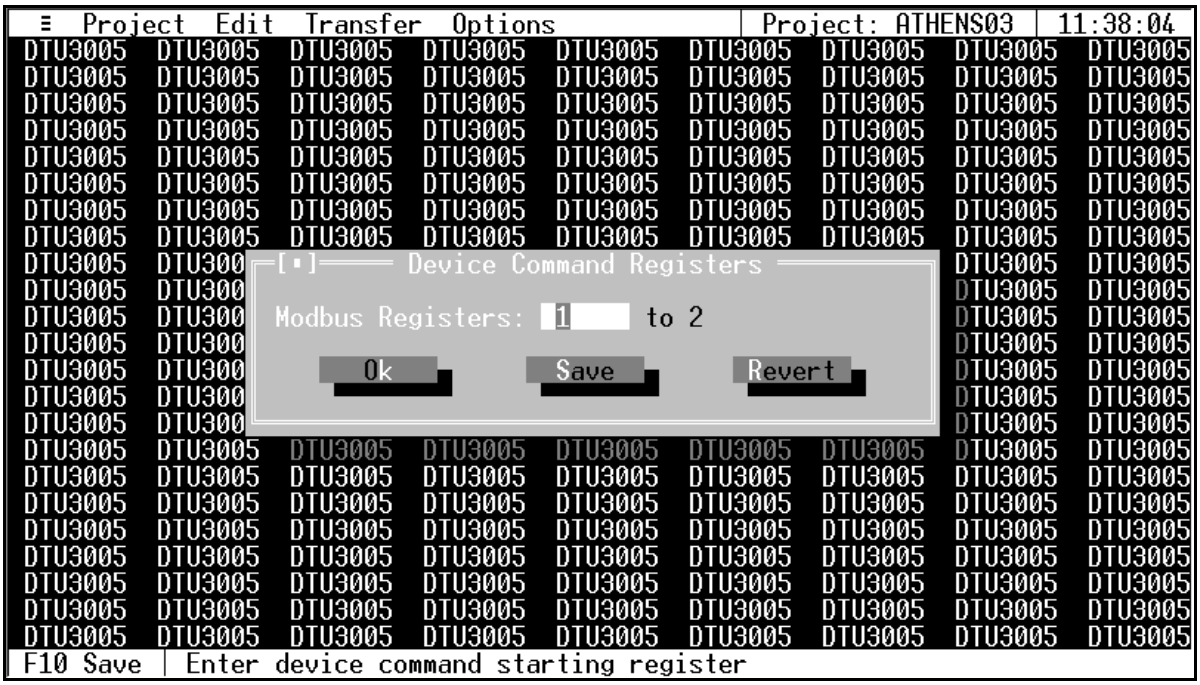
3. Select **Save** to save the information to the project file, and then select **Ok** or press **Esc** to exit the device diagnostic registers screen. If at any time you want to return to the last saved version of the device diagnostics registers, select **Revert** without saving any changes.

5.11 Device Command Registers

The device command registers consist of two consecutive registers for each device entered in the device list. These registers allow the Modbus Master device to transmit commands to each of the devices by writing to the appropriate register. The first register contains the command, and the second register contains the data associated with the command. The format of the command registers for each device are described in **Appendix E**.

All the command registers are placed in contiguous locations and are assigned to each device in the order that they are listed in the device list. To indicate the location of the command registers, follow these steps:

1. Select **Device Command Registers** from the **Edit** menu. The Device Command Registers screen appears:



2. Enter the starting register address in the **Modbus Registers** field. The DTU3005 Editor software will determine the proper number of registers for the number of devices entered in the device list and indicate the final register number. The registers used are the holding registers (40000 to 49999). Thus entering a register number of 1 will represent register 40001, etc. These registers must be different from those used for device data and diagnostics. Failure to use different register addresses will cause communication errors, and may cause unexpected operation of the devices.

3. Select **Save** to save the information to the project file, and then select **Ok** or press **Esc** to exit the device command registers screen. If at any time you want to return to the last saved version of the device diagnostics register, select **Revert** without saving any changes.

5.12 Saving the Project File

Now you have completed configuring the DTU3005 for Modbus Master to Devices communications. Select **Save** from the **Project** menu and press **Enter**, or press **F10** to save the project file to disk. The next step is to transfer the project to the DTU3005 unit. This topic is covered in **Chapter 7**.

6 Creating Project Files—SEAbus Port Expander

This chapter covers configuration of the DTU3005 as a SEAbus port expander. Once you have created a SEAbus port expander project (see **Chapter 3**), follow the directions in this chapter to configure the project file. Then see **Chapter 7** for directions on downloading the project to the DTU3005.

When configured as a SEAbus port expander, the DTU3005 allows two computers running supervisory software, such as WinPM, to connect to the same Siemens SEAbus devices. Up to 32 devices may be attached to port 2 of the DTU3005 by an RS-485 connection. This configuration is shown below in **Figure 6.1**.

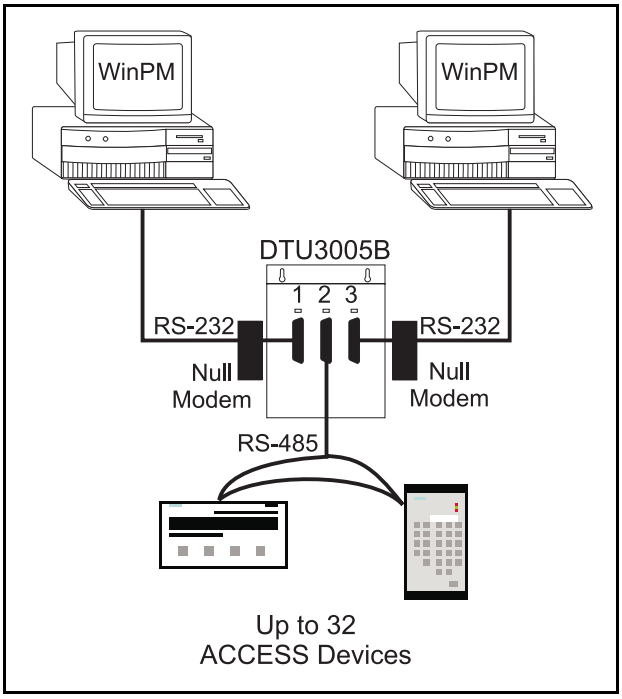
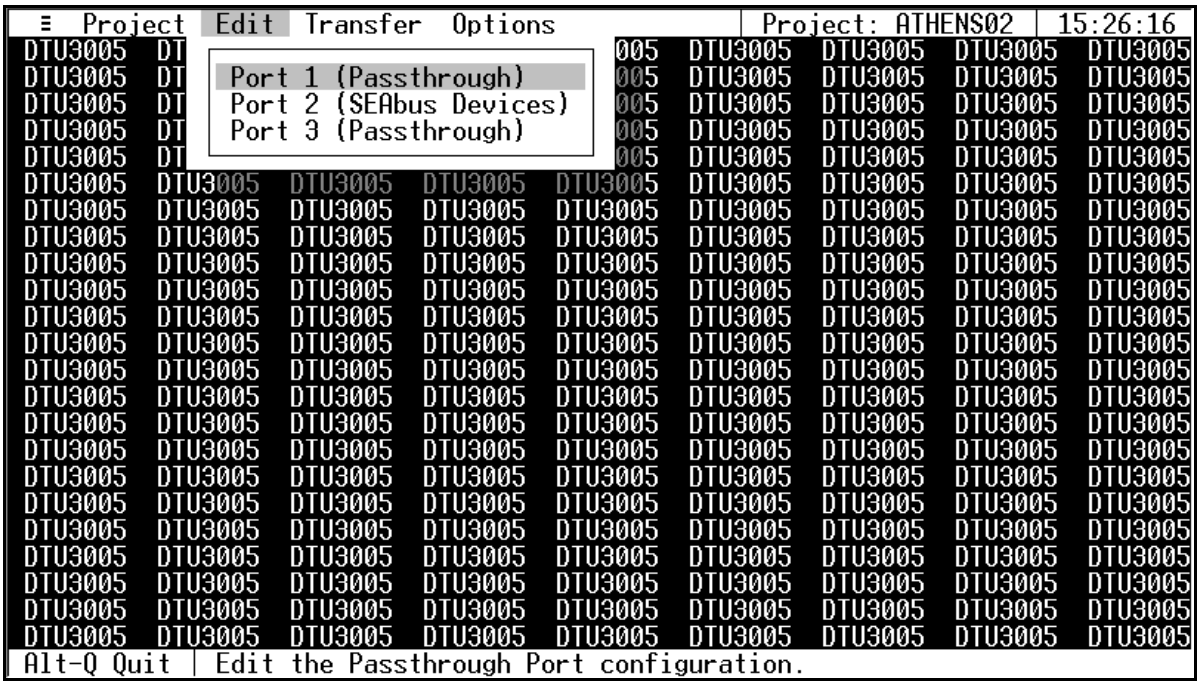


Figure 6.1 Dual Passthrough Application

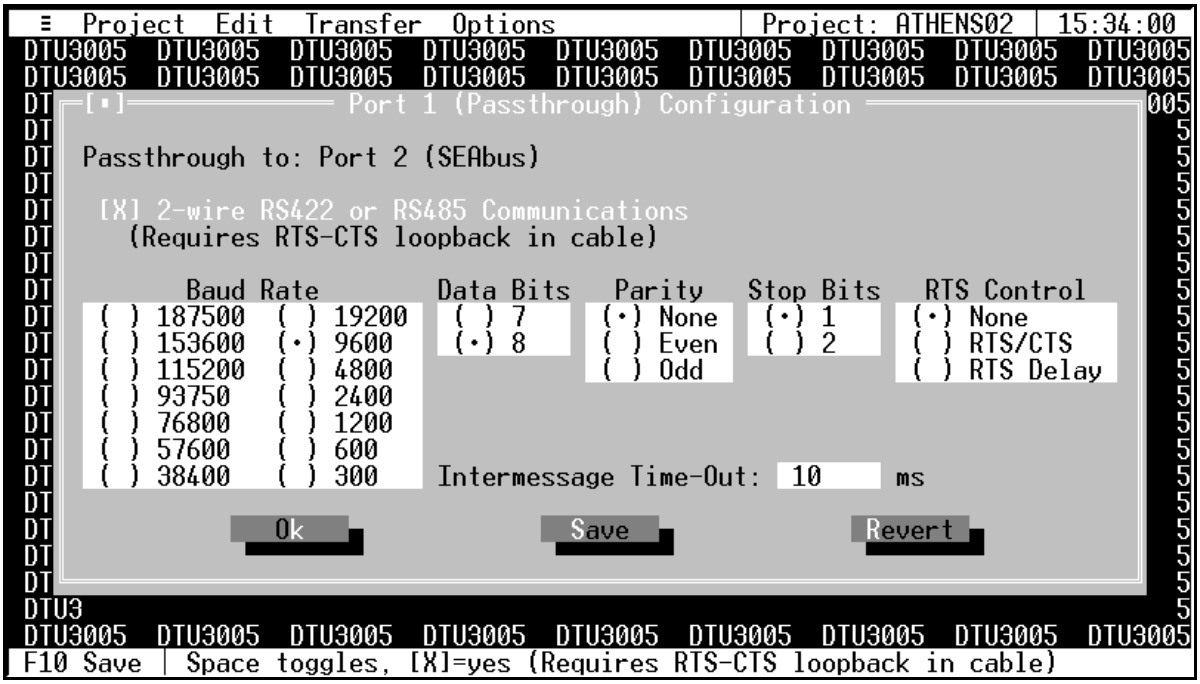
Once you have created or opened the project file, select **Edit** from the main menu and the following menu items appear:

- **Port 1 (Passthrough)**—allows you to configure the communications settings for the supervisory computer connected to port 1.
- **Port 2 (SEAbus Devices)**—allows you to configure communications settings for SEAbus devices connected to port 2.
- **Port 3 (Passthrough)**—allows you to configure the communications settings for the supervisory computer connected to port 3.



6.1 Passthrough Setup—Port 1

You must have a SEAbus Port Expander project file open to configure port 1 using the instructions in this section. Select **Port 1 (Passthrough)** from the **Edit** menu, and the Port 1 (Passthrough) configuration screen appears.



2-Wire RS422 or RS485 Communications

The **2-Wire RS422 or RS485 Communications** selection box will only need to be checked if the communications with your supervisory computer is a 2-wire RS485 or RS422 interface. An example of this is if you are using a RS-232/485 converter to extend the distance between your computer and the DTU3005.

When 2-wire communications are being used, RTS must be looped back to CTS on the DTU side of the cable. This can be done on the RS232 side by looping pins 4 and 5 or on the RS422/485 side by looping 16 to 18 and 17 to 19. See **Appendix D** for wiring diagrams for your particular PLC, and whether it uses a 2-wire connection.

To select the checkbox, click on it with the mouse or, with the **2-Wire RS422 or RS485 Communications** selection highlighted, press the **spacebar**. An "X" will appear inside the brackets when it is selected.

Press the **Tab** or **Right Arrow** key to move to the next field without selecting this checkbox.

Communications Settings

Before changing any of these settings, consult your computer, modem, or RS-232/485 converter manual for the correct settings. To move between the communications settings, press the **Tab** or **Enter** keys. To select a setting, use the **Up** or **Down Arrow** key to move to the desired setting and press the **spacebar** to change your selection.

RTS Control (Request to Send Control)

RTS Control selection is an option provided for modems or for RS-232/485 converters that require RTS to be active only while the DTU is transmitting to the computer.

- If **RTS/CTS** is selected, the DTU will activate RTS and wait until CTS is active before transmitting to the computer attached to port 1.
- If **RTS Delay** is selected, the DTU will activate RTS and wait for the specified delay time to pass before transmitting. When **RTS Delay** is selected, the program displays an entry box for the RTS delay time. Enter the time in milliseconds.

Intermessage Time-Out

The DTU3005 uses the intermessage time-out to determine when a complete message has been received on the passthrough port. Once the first character of a message has been received, if the amount of time specified by the intermessage time-out passes with no additional characters being received, the DTU3005 will consider the message to be complete and process it.

To change the intermessage time-out, select **Intermessage Time-Out** and enter the value in milliseconds. Then press the **Enter** key.

Saving Port 1 Configuration Information

Once you have entered all the configuration information, select **Save** to save the configuration to the project file. Then select **Ok** or press the **Esc** key to close the configuration screen.

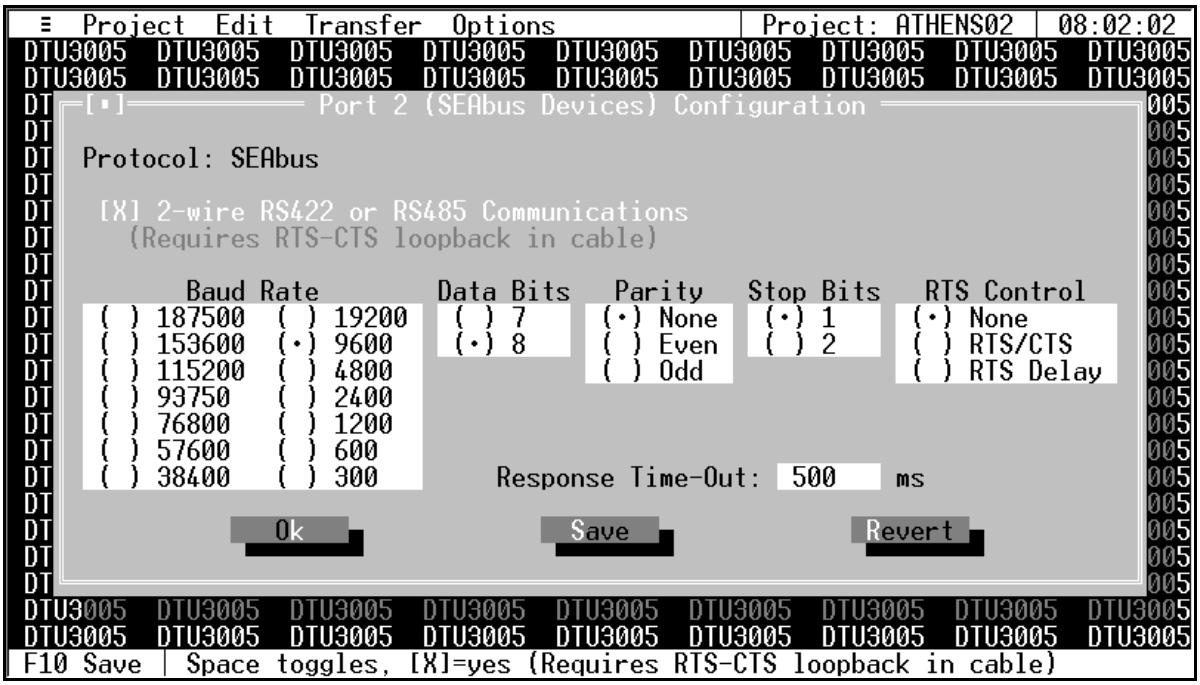
If you have changed the configuration and have not saved it to the project file, you will be prompted to either save or discard the changes.

Select **Revert** to return to the last previously saved configuration without saving any changes.

6.2 SEAbus Device Setup—Port 2

One or more Siemens devices may be connected to port 2. You must have a SEAbus Port Expander project file open to configure port 2 using the instructions in this section.

Select **Port 2 (SEAbus Devices)** from the **Edit** menu, and the Port 2 configuration screen appears.



Configuration Information

The configuration selections with the exception of Response Time-Out are the same as those for port 1. Refer to **Section 6.1** for instructions on configuring these fields.

Response Time-Out

The Response Time-Out tells the DTU how long to wait after transmitting a request to the PLC if no response has been received from the PLC. After this amount of time passes with no response being received, the DTU will assume that no response is coming and will retry the request. Enter the time in milliseconds.

Saving Port 2 Configuration Information

Once you have entered all the configuration information, select **Save** to save the configuration to the project file. Then select **Ok** or press the **Esc** key to close the configuration screen.

If you have changed the configuration and have not saved it to the project file, you will be prompted to either save or discard the changes.

Select **Revert** to return to the last previously saved configuration without saving any changes.

6.3 Passthrough Setup—Port 3

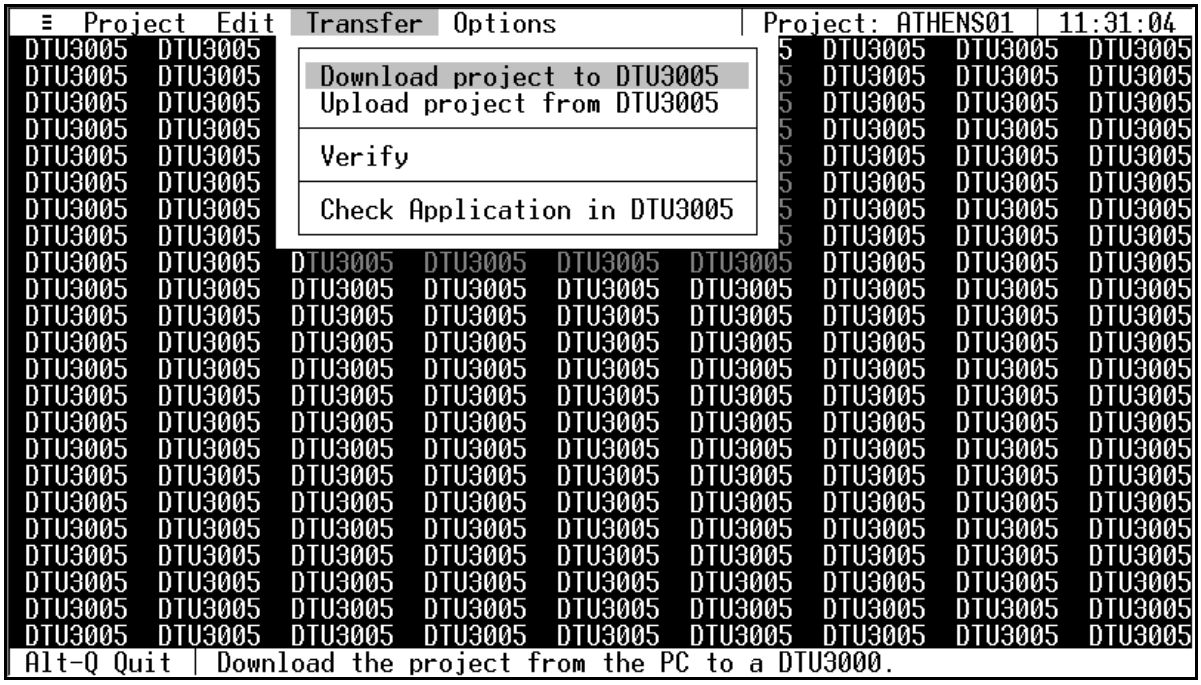
Select **Port 3 (Passthrough)** from the **Edit** menu, and the Port 3 Passthrough configuration screen appears. It is identical to the port 1 configuration screen, but configures the communications settings for the supervisory computer connected to port 3. The settings can be different than those for port 1, depending on the system. See **Section 6.1** for directions for setting up the passthrough port.

After configuring port 3, select **Save** to save the port 3 configuration to the project file, and then select **Ok** or press **Esc** to exit the Port 3 Passthrough configuration screen.

7 Transferring Project Files

Once you have configured and saved your project file for your particular application, you need to download it to the DTU3005 unit. First verify which COM port on your computer is used to upload and download projects to the DTU3005 unit (see **Chapter 8**). Then, select **Transfer** from the main menu and the following selections are available:

- **Download project to DTU3005**—allows you to transfer (download) any created project file from your PC to the DTU3005.
- **Upload project from DTU3005**—allows you to transfer (upload) the project file stored in the DTU3005 to the PC.
- **Verify**—allows you to verify a project file within your computer against the current project file stored in the DTU3005 unit.
- **Check Application in DTU3005**—allows you to check what type of project file is loaded (PLC to devices, Modbus Master to devices, or Passthrough) and which protocols have been loaded for each of the communication ports. It also reports the revision level of the DTU3005 unit's firmware.



Before using the **Transfer** commands, you must physically connect port 3 of the DTU3005B to your computer using a null modem cable. Also be sure that power is supplied to the DTU3005.

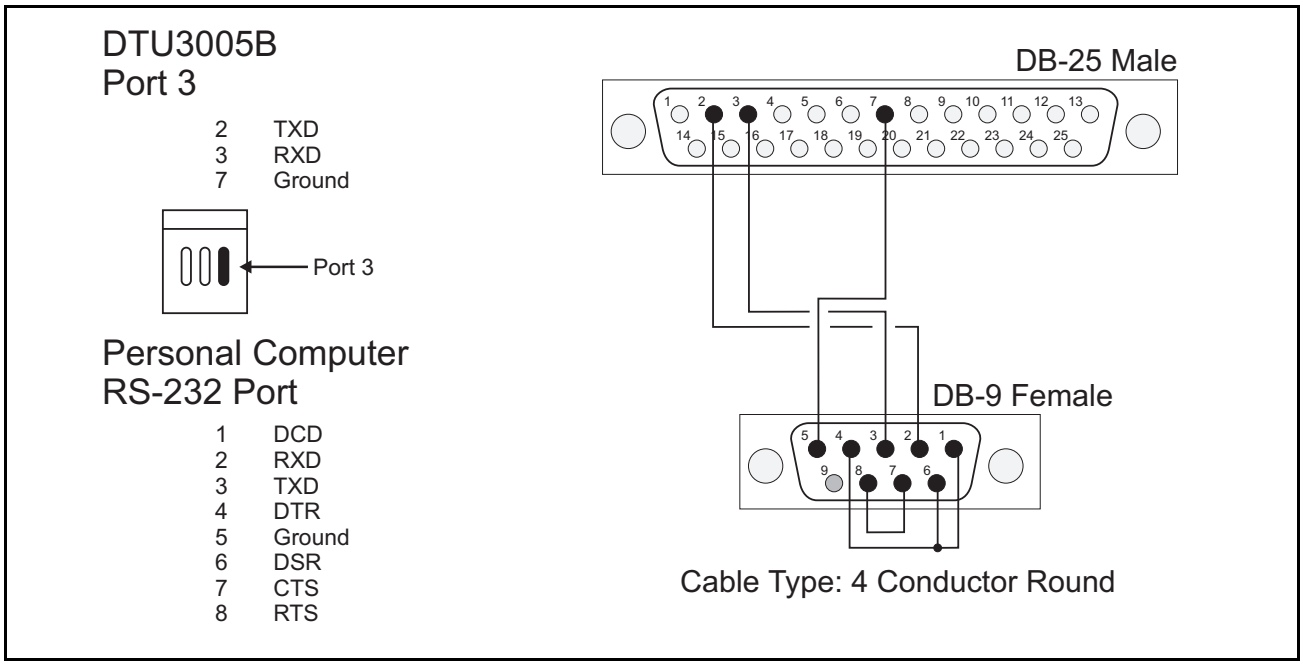


Figure 7.1 Null Modem Cable connection

The null modem cable will cross pins 2 and 3 (RXD and TXD). On the computer end of the cable, pins 7 and 8 (RTS and CTS) should be connected together. Also pins 1, 4, and 6 (DCD, DTR and DSR) should be connected together. The cable diagram is illustrated in **Figure 7.1**. In addition, the DIP switches on the front of the DTU3005B unit must be set to configuration mode as described below.

1. Power down the DTU3005B unit.
2. Set the DIP switches to configuration mode per the DIP switch settings listed below in **Table 7.1** and shown in **Figure 7.1**.
3. Restart the DTU3005B unit.
4. The status LED on the front of the DTU3005 unit flashes green to indicate that the unit is in configuration mode.

   Note: To return the device to normal operation, the DTU3005B unit must be powered off while the DIP switch settings are reset, then the unit will be in normal operation mode when it is powered up.

Table 7.1 Mode Switch Settings

Mode	Switch 1	Switch 2	Switch 3	Status LED
Normal Operation	Off	Off	Off	On steady
Configuration	Off	Off	On	Flashing Green

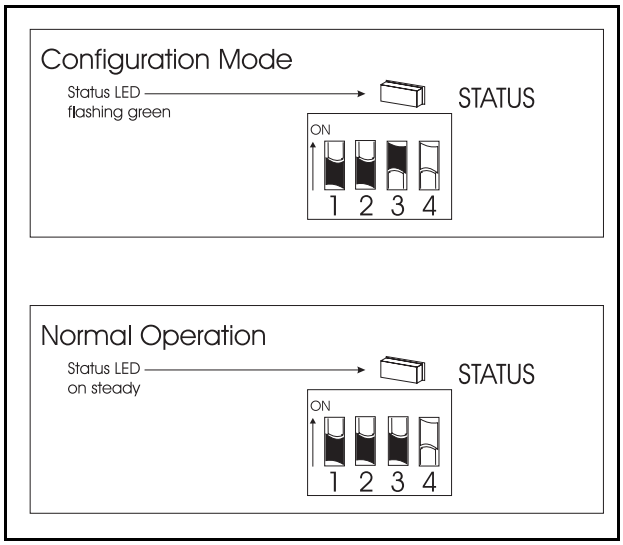


Figure 7.2 DIP Switch Settings for Normal Operation and Configuration Modes (Switch 4 is N/A)

71 Downloading Projects

Select **Download project to DTU3005** from the **Transfer** menu, and the following screen appears.

Select **Ok** and the DTU3005 Editor software transfers the currently displayed project to the DTU3005 unit.

7.2 Uploading Projects

Select **Upload project from DTU3005** from the **Transfer** menu, and the confirmation screen shown above appears. Select **Ok** and the DTU3005 Editor software transfers the project from the DTU3005 unit to your computer.

The computer will upload the project file under the name "NONAME." You must save this uploaded project file using the **Save As** command from the **Project** menu and enter your own file name.

7.3 Verifying Projects

Select **Verify** from the **Transfer** menu, and the confirmation screen shown above appears. Select **Ok** and the DTU3005 Editor software reads the project stored on the DTU3005 unit and compares it with the currently displayed project.

After completing the verification process, if the project files are the same, a message will appear stating "Data Verified OK". If the files are different, a message will be displayed stating which part of the project files are different.

7.4 Checking the DTU3005 Application

Select **Check Application in DTU3005** from the **Transfer** menu, and the confirmation screen shown above appears. Select **Ok** and the DTU3005 Editor software reads the project from the DTU3005 unit and reports the type of project and the firmware version.

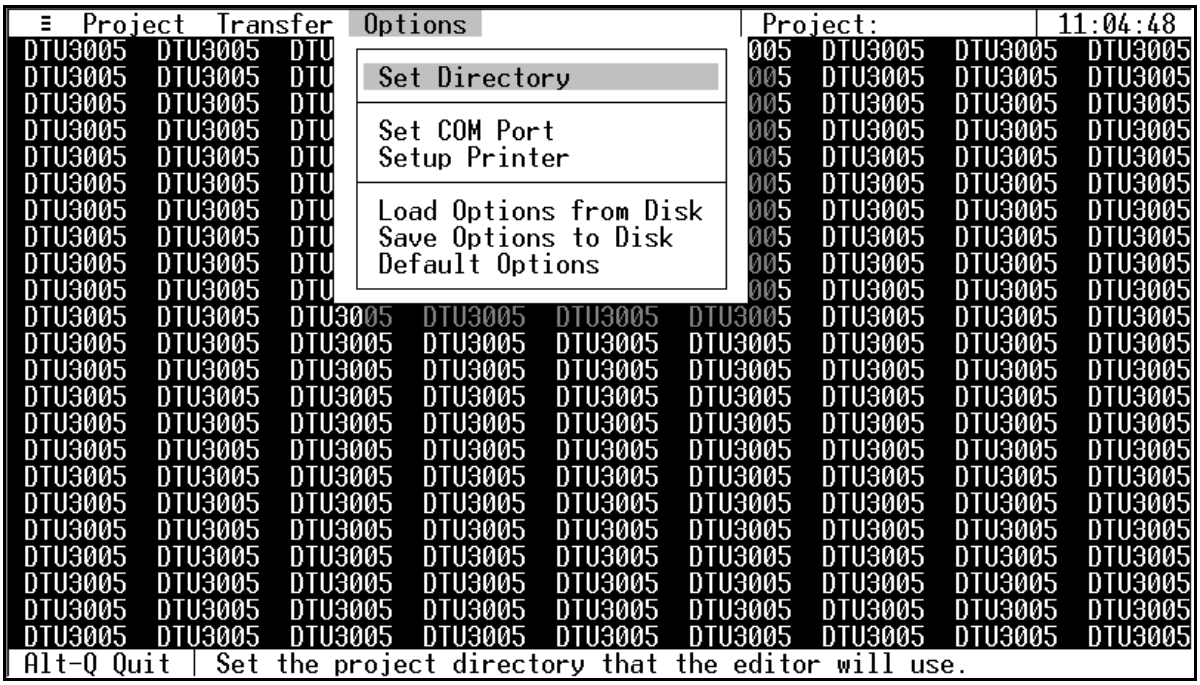
8 Setting Options

The **Options** menu allows you to configure settings for the DTU3005 Editor software and to load and save these settings. Options include the directory to which the program stores its project files, which COM port and printer port the program uses, and printer settings.

Until you save the Options to the PC hard drive (i.e., disk), any changes you make using the **Options** menu are only effective while you are running the Editor software. If you exit the Editor software without saving the Options to disk, any changes that you made will be considered temporary and will not be saved.

Select **Options** from the main menu to display the Options menu as shown below. The following menu items are available:

- **Set Directory**—changes the directory location on your hard drive where project files are saved and stored.
- **Set COM Port**—indicates which COM port on your computer is used to upload and download projects to the DTU3005 unit.
- **Setup Printer**—allows you to indicate which printer you want to use to print out the project file information. It also allows you to print to a file on the hard drive, and indicate how many lines your printer prints per page.
- **Load Options from Disk**—loads previously saved Options from the **`Editor.cfg`** file on the hard drive.
- **Save Options to Disk**—saves your Options to the **`Editor.cfg`** file on the hard drive, which makes these settings the new options.
- **Default Options**—resets the Option settings to the original default settings, which are the options that were in effect when the program was first installed and operated.

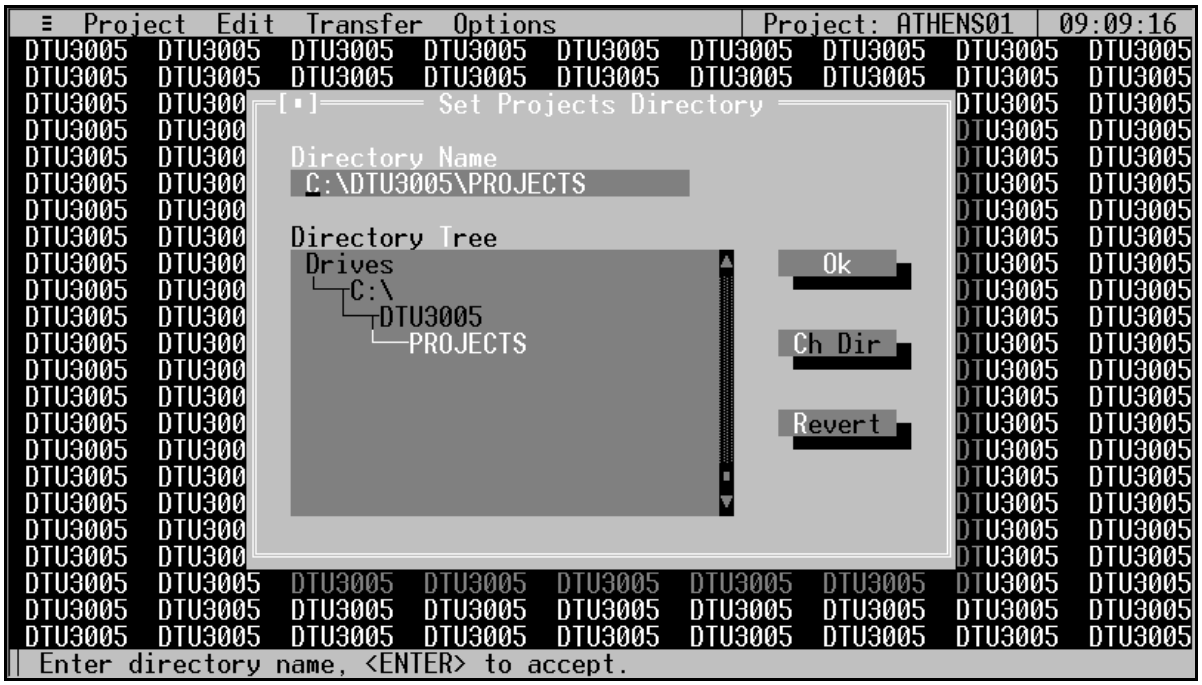


8.1 Setting the Project Directory

The DTU3005 Editor software saves all the project files to a designated project directory. The default directory is named **"PROJECTS"** and is located inside the Editor's program directory. If you want to use a different directory or drive, you can set the new directory using the **Set Directory** command. Some reasons you may want to change the directory are:

- To save the project files to a floppy disk or a network drive for security and archiving.
- To save the project files in the same location as other files, such as CAD drawings and specs, pertaining to your equipment.
- To save project files from different installations in separate directories.

1. To change the default project directory, select **Set Directory** from the **Options** menu. The **Set Projects Directory** screen appears:



2. The current directory path is shown in the **Directory Name** field, and a graphical representation of the directory path is shown in the **Directory Tree** field. You may type in a new directory in the **Directory Name** field, or select an existing directory from the **Directory Tree** list.

   a. To enter a new or existing directory, place the cursor in the **Directory Name** field by pressing the **Tab** key until the directory name is highlighted. Type in the full path name of the directory you wish to use. If the directory does not exist the following screen appears:

   b. Select **Yes** to create the new directory, or select **No** if the new directory name is not what you wanted.

3. To use the graphical **Directory Tree** field, select the field by pressing **Tab** until a directory name is highlighted. Use the **Up** and **Down Arrow** keys to

move up and down the directory tree. Press **Enter**, or select **Ch Dir** to see a list of all the subdirectories within the highlighted directory. To see a list of all the available drives, including diskettes and network drives, highlight **Drives** and press the **Enter** key.

4. When you select a directory, its full path name appears in the **Directory Name** field. To create a new subdirectory, move the cursor to the end of the path name in the **Directory Name** field, and type a backslash "\" and the new directory name.

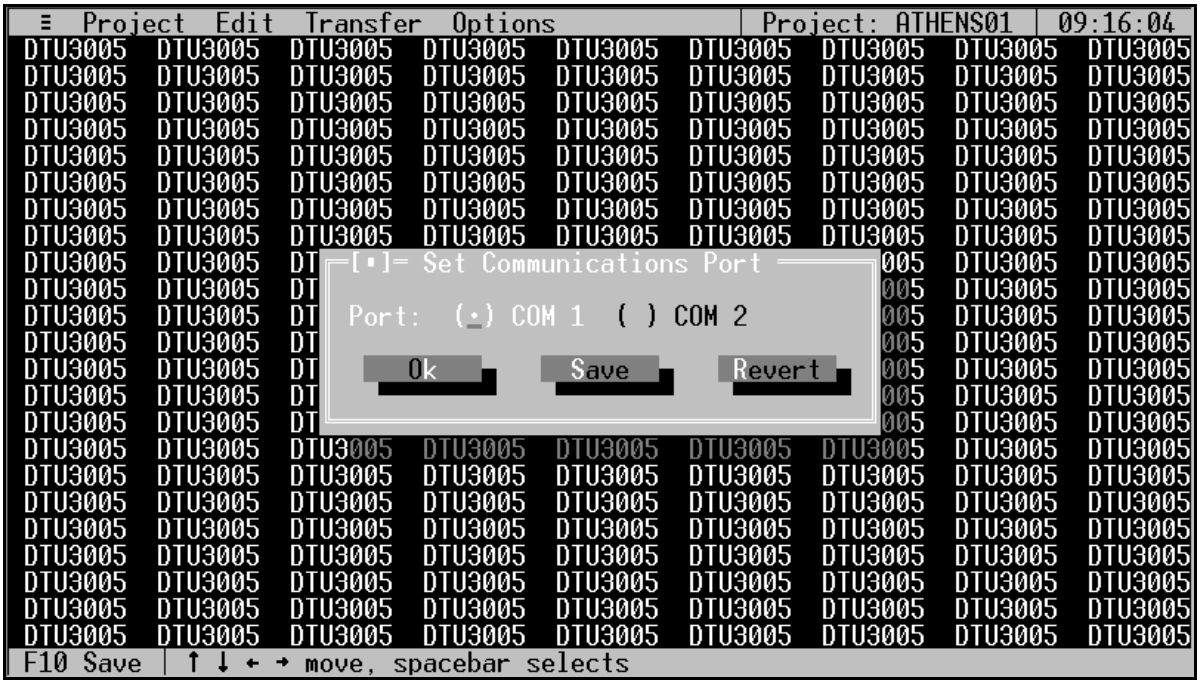
5. After you have selected the directory, select **Ok** to confirm the selection and exit the **Set Projects Directory** screen. Select **Revert** to return to the previously saved directory and cancel any changes.

8.2 Selecting the COM Port

The program sets COM 1 as the default port. If your mouse, modem, or other device is connected to COM 1, you must change this setting.

Note: Before downloading or uploading a project file to the DTU3005 unit, you must first configure the DTU3005 Editor software to use the correct communications port.

To change the communications port, select **Set COM Port** from the **Options** menu. The **Set Communications Port** screen appears:

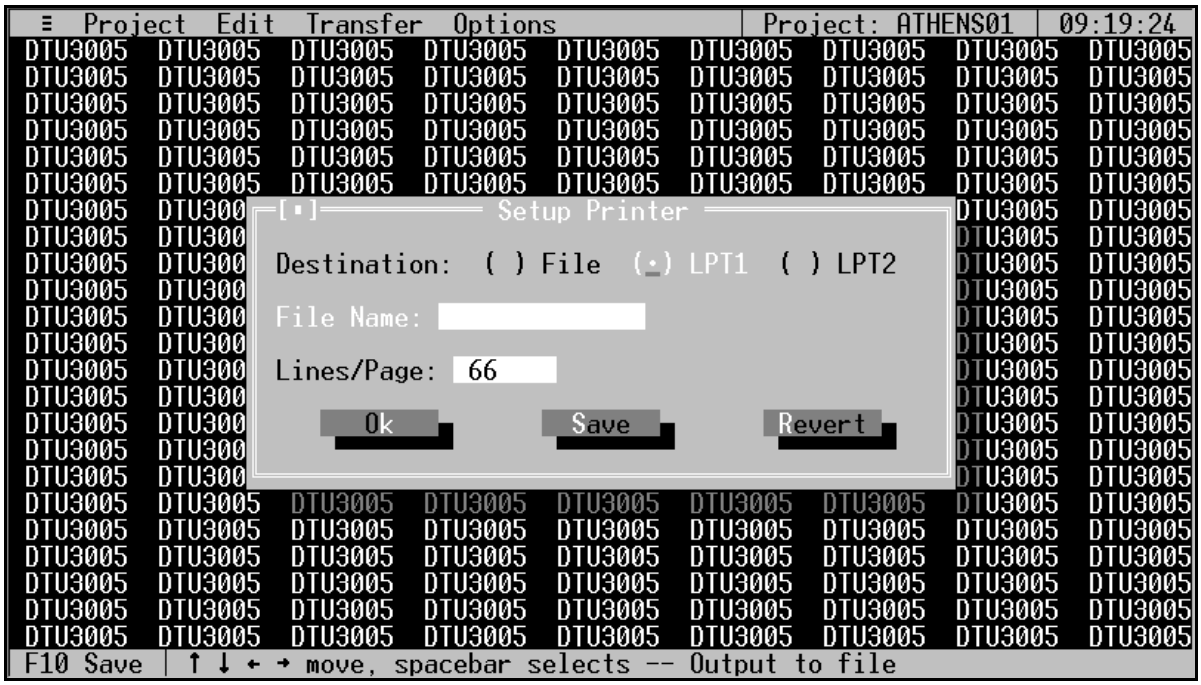


To select the communications port, use the **Left** and **Right Arrow** keys to move the highlight between COM 1 and COM 2. With the desired communications port highlighted, press the **spacebar** to select it. The dot at the cursor indicates which COM port is selected. Select **Save** to confirm your selection, then select **Ok** to exit the screen. Select **Revert** to return to the previously saved selection.

8.3 Setting the Printer Options

The printer settings allow you to indicate which printer port your printer is attached to, whether you want to print to a file which can be read by a word processing program, and how many lines fit on your printer's page.

1. To change printer options, select **Setup Printer** from the **Options** menu. The following screen displays:



2. To select the printer port, or to direct the printouts to a file, use the **Left** and **Right Arrow** keys to move the highlight between File, LPT1, and LPT2. With the desired selection port highlighted, press the **spacebar** to select it. The dot at the cursor indicates which choice is selected.

   a. If you have selected **File**, use the **Tab** key to move the highlight to the **File Name** field. Enter a name for the file of up to eight letters and numbers. This file will be saved to the DTU3005 Editor software directory when you select **Print** from the **Project** menu.

   b. Next, enter the number of lines per page your printer prints in the **Lines/Page** field. You may want to print out a page to determine this value.

3. Select **Save** to confirm your selections, then select **Ok** to exit the screen. Select **Revert** to return to the previously saved settings.

8.4 Loading and Saving Options

The Option settings are stored in file **`Editor.cfg`** on the PC hard drive. When the Editor software is first installed and operated, the **`Editor.cfg`** file contains the default Option settings. If you make any changes using the Options menu, the Editor software gives you three choices for saving changes:

- If you want to keep these changes, you should **Save Options to disk.** This action will save your changes to the **`Editor.cfg`** file on the hard drive, which makes these settings the new options.

- If you want to change Options only temporarily, such as during a particular session you are running, then, you can make changes as desired but **not** save the Options to disk.

- If you start changing Options for either permanent or temporary use, then you change your mind and want to restore the previous settings, you can **Load Options from Disk** to load the previously saved Options from the **`Editor.cfg`** file on the hard drive.

In addition, the **Default Options** resets the Option settings to the original default settings, which are the options that were in effect when the program was first installed and operated.

Example Procedure

1. To load previously saved options settings, select **Load Options from Disk** from the **Options** menu. The following screen appears:

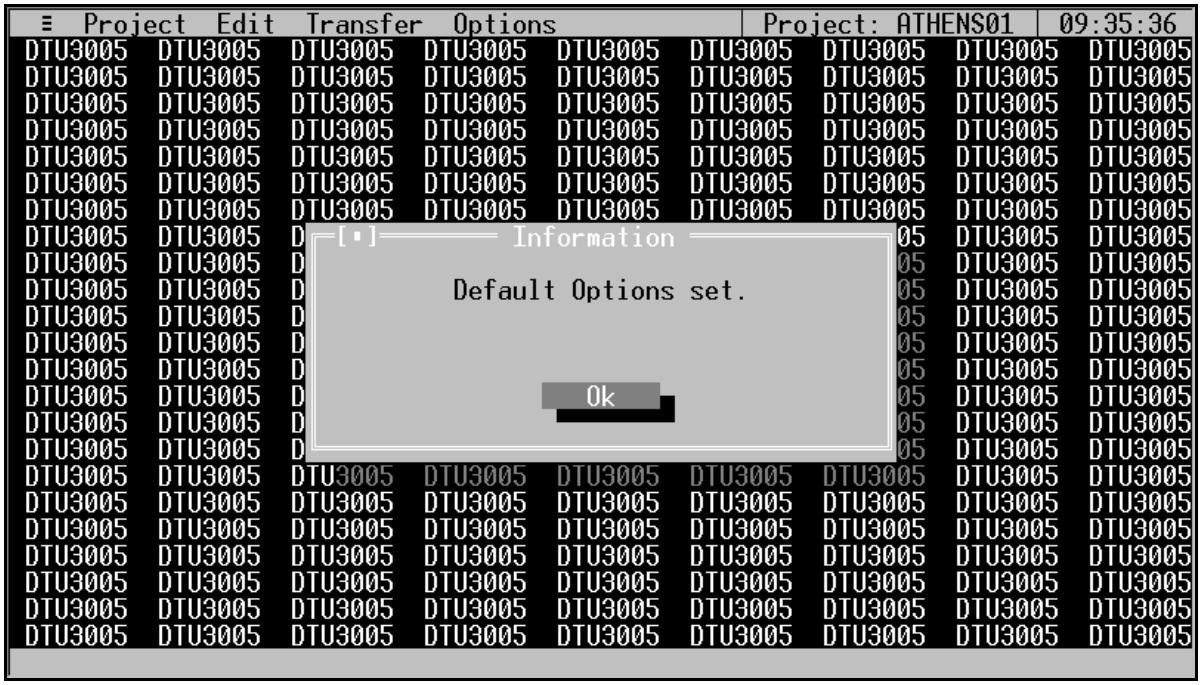
2. If you have not previously saved your option settings, the following screen appears:

3. Select **Ok** to continue.

4. To save your options settings to the hard drive, select **Save Options to Disk** form the **Options** menu. The following screen appears, indicating that the options were successfully saved.

5. Select **Ok** to continue. The options settings will remain in effect the next time you run the DTU3005 Editor software.

If you wish to return to the default options that were in effect when you ran the program for the first time, select **Default Options** from the **Options** menu. The following screen appears, indicating that the original settings were restored:



Select **Ok** to continue. You need to save the default options by selecting **Save Options to Disk** from the **Options** menu to ensure that these options remain in effect the next time you run the program.

A Supported PLCs

Table A.1 Supported PLCs and Protocols

App. No.	Manufacturer	Model	Protocol
A.1	Allen-Bradley	PLC-5 4 SLC 503, SLC 50 Micrologix	DF1 Full-Duplex
A.2	GE Fanuc	90/20, 90/30, 90/70, Micro	SNP
A.3 A.4	Idec	FA Series Micro-3	1:1 Computer Link Computer Link
A.5 A.6 A.7	Koyo	205, 305, 405 Series	DirectNet (Link Port) K-Sequence (Prog Port)
A.8	Mitsubishi	FX, FXo, FXon	Monitor Interface
A.9	Modicon	All models	Modbus RTU or ASCII
A.10	Omron	C Series, CQM Series	Host-Link
A.11	Siemens	S7-200	Point-to-Point (PPI)
A.14	Siemens/TI	500 Series	ASCII Data Link
A.4 A.12 A.13	Square D	Model 50 Models 100-700 TSX07	1:1 Computer Link SY/MAX (Prog Port) Uni-Telway
A.15 A.16	Toshiba	EX, M Series, T Series	Computer-Link Binary Computer-Link ASCII
A.17	Westinghouse	PC-1100	Programming Port

Application Notes

A.1 Allen-Bradley PLC 5, SLC500 and MicroLogix PLCs

Registers Accessed

The DTU3005 will only access registers in integer files in the PLC memory (N file types). When specifying register numbers in the DTU3005 Editor Program, the file number is entered into the **File** field, and the element number within the file is entered into the **Register** field. Initial register number is 0.

Protocols Supported

The DTU3005 uses the DF1 protocol, which is also known as Full Duplex or Point-to-Point. It supports both the CRC and BCC methods of error checking.

Please note that the MicroLogix PLC only supports the CRC method of error checking. Therefore, when using a MicroLogix PLC, the protocol selected on the port configuration screen in the DTU3005 Editor software must be “AB SLC500 (CRC)”.

A.2 GE Fanuc 90/20, 90/30 and 90/70 PLCs

Registers Accessed

The DTU3005 will only access registers in the Data Register Area of PLC memory (%R1 to %R9999). When entering register numbers, only the offset into this area (1-9999) should be entered. For example, to access register number %R1, the value 1 should be entered. To access register number %R9999, the value 9999 should be entered.

A.3 Idec Micro-3 PLCs

Registers Accessed

The DTU3005 will only access registers in the Data Register Area of PLC memory (D0 to D9999). When entering register numbers, only the offset into this area (0-9999) should be entered. For example, to access register number D1, the value 1 should be entered. To access register number D9999, the value 9999 should be entered.

Link Adapter Requirement

The DTU3005 requires an Idec Link Adapter or equivalent to be used when communicating with any of the FA Series PLCs.

A.4 Idec FA Series PLCs and Square D Model 50

Registers Accessed

The DTU3005 will only access registers in the Data Register Area of PLC memory (D0 to D9999). When entering register numbers, only the offset into this area (0-9999) should be entered. For example, to access register number D1, the value 1 should be entered. To access register number D9999, the value 9999 should be entered.

Link Adapter Requirement

The DTU3005 requires an Idec Link Adapter or equivalent to be used when communicating with any of the FA Series PLCs.

A.5 Koyo/PLC Direct 205 Series PLCs

Registers Accessed

The DTU3005 can access all register types in the 205 Series PLC through the use of the V-Memory assignments shown in the following table:

Table A.2 Koyo/PLC Direct 205 Registers

V-Memory Address	PLC Registers Accessed
V00000 – V00177	Timer T0 – T177 Current Values

Table A.2 Koyo/PLC Direct 205 Registers (Continued)

V-Memory Address	PLC Registers Accessed
V01000 – V01177	Counter CT0 – CT177 Current Values
V02000 – V03777	Data Words V2000 – V3777
V04000 – V04377	Non-Volatile Data Words V4000 – V4377
V40400 – V40423	Input Points X0 – X477 (16 per V-Memory word)
V40500 – V40523	Output Points Y0 – Y477 (16 per V-Memory word)
V40600 – V40617	Control Relays C0 – C377 (16 per V-Memory word)
V41000 – V41037	Stages S0 – S777 (16 per V-Memory word)
V41100 – V41107	Timer T0 – T177 Status Bits (16 per V-Memory word)
V41140 – V41147	Counter CT0 – CT177 Status Bits (16 per V-Memory word)

Note: The V-Memory word numbers in the above table are shown in octal. These numbers must be converted to decimal before they are entered into the DTU3005 Configuration Software. For example, if the DTU3005 is to access register V02000, the value 2000 in octal corresponds to the value 1024 in decimal. The value 1024 is then entered into the DTU3005 Editor Program.

Device data should be written to the data registers starting at V02000 octal, or 1024 decimal for the DTU3005 Editor Program.

A.6 Koyo/PLC Direct/TI 405 Series PLCs

Registers Accessed

The DTU3005 can access all register types in the 405 Series PLC through the use of the V-Memory assignments shown in the following table:

Table A.3 Koyo/PLC Direct/TI 405 Registers

V-Memory Address	PLC Registers Accessed
V00000 – V00377	Timer T0 – T377 Current Values
V01000 – V01177	Counter CT0 – CT177 Current Values
V01400 – V07377	Data Words V1400 – V7377
V10000 – V17777	Data Words V10000 – V17777
V40000 – V40077	Remote I/O GX0 – GX1777 (16 per V-Memory word)
V40400 – V40423	Input Points X0 – X477 (16 per V-Memory word)
V40500 – V40523	Output Points Y0 – Y477 (16 per V-Memory word)
V40600 – V40677	Control Relays C0 – C1777 (16 per V-Memory word)

Table A.3 Koyo/PLC Direct/TI 405 Registers

V-Memory Address	PLC Registers Accessed
V41000 – V41077	Stages S0 – S1777 (16 per V-Memory word)
V41100 – V41117	Timer T0 – T377 Status Bits (16 per V-Memory word)
V41140 – V41147	Counter CT0 – CT177 Status Bits (16 per V-Memory word)

Note: The V-Memory word numbers in the above table are shown in octal. These numbers must be converted to decimal before they are entered into the DTU3005 Configuration Software. For example, if the DTU3005 is to access register V02000, the value 2000 in octal corresponds to the value 1024 in decimal. The value 1024 is then entered into the DTU3005 Editor Program.

Device data should be written to the data registers starting at V01400 octal, or 768 decimal for the DTU3005 Editor software.

A.7 Koyo/PLC Direct/TI 305 Series PLCs

Registers Accessed

The DTU3005 will only access registers in the Data Area of PLC memory (R400–R577 and R700–R777) which are 8-bit registers. Because the DTU3005 will only read and write 16-bit values, it will use two consecutive 8-bit registers in the 305 Series PLCs to form a 16-bit value. The first of these consecutive registers must be located on an even boundary (i.e. R400, R402, etc.). The low order byte of the 16-bit value is located in the lowest numbered register and the high order byte is located in the highest numbered register.

When entering register numbers into the DTU3005 Configuration Software, they must be converted from octal to decimal. For example, if the DTU3005 is to access register R400 (and R401), the value 400 in octal is converted to the value 256 in decimal. This value of 256 is then entered into the DTU3005 Editor Program.

A.8 Mitsubishi FX Series PLCs

Registers Accessed

The DTU3005 will only access registers in the Data Register Area of PLC memory (D0 to D9999). When entering register numbers, only the offset into this area (0-9999) should be entered. For example, to access register number D1, the value 1 should be entered. To access register number D9999, the value 9999 should be entered.

RTS Control

The Mitsubishi FX-32 and equivalent PLCs require RTS to be active when sending to the PLC and inactive when receiving from the PLC. The DTU3005 can be

configured to do so by performing the following steps when configuring the PLC Port in the DTU3005 Editor Program:

1. Select “RTS Delay” in the **RTS Control** selection box.

2. Set the **RTS Delay** time to 2 ms.

A.9 Modbus PLCs and Devices

Registers Accessed

The DTU3005 will only access registers in the Holding Area of PLC memory (40001 to 49999). When entering register numbers, only the offset into this area (1-9999) should be entered. For example, to access register number 40001, the value 1 should be entered. To access register number 49999, the value 9999 should be entered.

A.10 Omron PLCs

Registers Accessed

The DTU3005 will only access registers in the Data Area of PLC memory (DM0 to DM9999). When entering register numbers, only the offset into this area (0-9999) should be entered. For example, to access register number DM1, the value 1 should be entered. To access register number DM9999, the value 9999 should be entered.

PLCs/Protocols Supported

The DTU3005 will communicate with any Omron PLC that uses the Host Link Protocol. On many PLCs, this requires the use of a Host Link Module.

A.11 Siemens S7-200 PLCs

Registers Accessed

The DTU3005 will only access registers in the V-Memory area of PLC memory (VB0 to VB9999) which are 8-bit registers. Because the DTU3005 will only read and write 16-bit values, it will use two consecutive 8-bit registers in Siemens S7 PLCs to form a 16-bit value. The first of these consecutive registers must be located on an even boundary (i.e. VB0, VB2, etc.). The low order byte of the 16-bit value is located in the lowest numbered register and the high order byte is located in the highest numbered register. These registers can also be accessed in the PLC program or in Charts as 16-bit registers VW0, VW2, VW4, etc.

When entering register numbers, only the offset into the V-Memory area (0-9998) should be entered. For example, to access register number VW0 (VB0 and VB1), the value 0 should be entered. To access register number VW9998 (VB9998 and VB9999), the value 9998 should be entered.

Protocol Information

The DTU-3000 follows the Point-to-Point (PPI) protocol specification for token passing masters used with Siemens S7-200 PLCs. It will operate on a PPI network along with other masters.

The fully implemented, multi-master version of the PPI protocol is very slow because of the token passing. Therefore, a unique feature has been implemented on the DTU3005 which allows it to run as a single master with no token passing. This feature can only be used when no other masters are present on the PPI network. To activate this feature, enter the value 125 into the DTU Address field on the PLC Port configuration screen in the DTU3005 Editor Program. Whenever the DTU Address (address which it resides at on the PPI network) is set to 125, it will act as a single master.

Passthrough Port

For Siemens S7-200 PLCs, there is an additional advantage to the “Passthrough” port of the DTU3005. It allows a non-token passing master such as a personal computer running Micro/DOS to have access to a multiple-master token passing network without the requirement for an MPI card in the personal computer. This feature can only be used when the DTU Address is not set to 125 (see above).

A.12 Square D Model 100-700 PLCs

Registers Accessed

The DTU3005 will only access registers in the Data Area of PLC memory (S10 to S9999). When entering register numbers, only the offset into this area (10-9999) should be entered. For example, to access register number S10, the value 10 should be entered.

A.13 Square D TSX07 PLCs

Registers Accessed

The DTU3005 will only access registers in the Memory Word Area of PLC memory (%MW0 to %MW999). When entering register numbers, only the offset into this area (0-999) should be entered. For example, to access register number %MW0, the value 0 should be entered. To access register number %MW999, the value 999 should be entered.

A.14 TI505 Series PLCs

Registers Accessed

The DTU3005 will only access registers in the V Area of PLC memory (V1 to V9999). When entering register numbers, only the offset into this area (1-9999) should be entered. For example, to access register number V1, the value 1 should be entered. To access register number V9999, the value 9999 should be entered.

Passthrough Port

When using TISOFT PLC programming software on the passthrough port (Port 3) of the DTU3005, the software must be invoked with the following parameters:

p1 T0 0 (for PC COM Port 1)
or
p2 T0 0 (for PC COM Port 2)

For example, if you are using a 545 PLC and you are using COM2 on your PC, you would invoke TISOFT as follows:

TI545 p2 T0 0

These parameters will prevent the programming software from switching over to the Transparent Byte Protocol, which is not supported by the DTU3005.

A15 Toshiba EX and M Series PLCs

Registers Accessed

The DTU3005 will only access registers in the Data Register of PLC memory (D0 to D9999). When entering register numbers, only the offset into this area (0-9999) should be entered. For example, to access register number D0, the value 0 should be entered. To access register number D9999, the value 9999 should be entered.

Protocols Supported

The DTU3005 will only communicate with Toshiba EX and M Series PLCs using the Binary Computer Link protocol.

A16 Toshiba T Series PLCs

Registers Accessed

The DTU3005 will only access registers in the Data Register of PLC memory (D0 to D9999). When entering register numbers, only the offset into this area (0-9999) should be entered. For example, to access register number D0, the value 0 should be entered. To access register number D9999, the value 9999 should be entered.

Protocols Supported

The DTU3005 will only communicate with Toshiba T Series PLCs using the ASCII Computer Link protocol.

A17 Westinghouse PLCs

Registers Accessed

The DTU3005 will only access registers in the Holding Register of PLC memory (HR1 to HR9999). When entering register numbers, only the offset into this area (1-9999) should be entered. For example, to access register number HR1, the value 1 should be entered. To access register number HR9999, the value 9999 should be entered.

B Supported Devices

The following Siemens ACCESS devices are supported by the DTU3005B.

Table B.1 Supported Siemens Devices

Device
4720 Power Meter
4700 Power Meter
4300 Power Meter
Static Trip III Trip Unit
SAMMS-MV Motor Protection Device
SAMMS-LV Motor Protection Device
ISGS Intelligent SwitchGear System Protective Relay
S7-I/O Addressable Relay
Sentron SB Energy Communicating Trip Unit

In addition, the following Siemens protective relays and measuring transducers using the VDEW protocol can be connected using the DTU3005B. This device is designed for use with DIGSI Configuration software. SEAbus port expander mode is not supported for this device.

Table B.2 Supported Siemens Protective Relays and Measuring Transducers

Device
7SA511 Feeder Protection Relay
7SA513 EHV Line Protection Relay
7SD511 Current Comparison Protection Relay
7SD512 Current Comparison Protection Relay
7SJ511 Overcurrent Protection Relay
7SJ512 Feeder Protection Relay
7SJ531 Line and Motor Protection Relay
7SJ600 Overcurrent Protection Relay
7UT512 Differential Protection Relay
7UT513 Differential Protection Relay
7KG6000 (SIMEAS T) Measuring Transducer

B1 Application Notes—Communication Port Settings for 7-Series Protective Relays

The following are the required settings in the relays for communications.

All relays (except 7SJ600)

Table B.3 7200 Rear Port Settings

Menu Number	Menu	Setting
7201	Device Address	Set to a unique address to be used in the DTU.
7208	Function Type	This must be left at its default value of "176".
7221	Rear Port Parity	Set this to 8N1, 8 data bits, no parity, and 1 stop bit.
7222	Rear Format	Set this to "VDEW Extension".
7225	Rear Baud	Set this to match the baud rate of the configuration in the DTU.

7SJ600

Table B.4 72 Port Settings

Menu	Setting
DEVICE	Set to a unique address, between 1 and 254, which will be used in the DTU.
F-TYPE	This should be left at its default value of "160".
PC-INT	Data format of this interface should be set to "DIGSI V3".
BAUD	Set this to match the baud rate of the configuration in the DTU.
PARITY	Set this to 8N1, 8 data bits, no parity, and 1 stop bit.

C Installing the Hardware

The DTU3005 device is a compact, low-power, sealed device designed for use in an industrial environment. It can be mounted on any flat surface inside equipment cabinets requiring only nominal ventilation for convection cooling. Four inches clearance in front of the unit is required for attachment of communication cables. A modular connector is supplied for unit power.

C.1 Dimensions

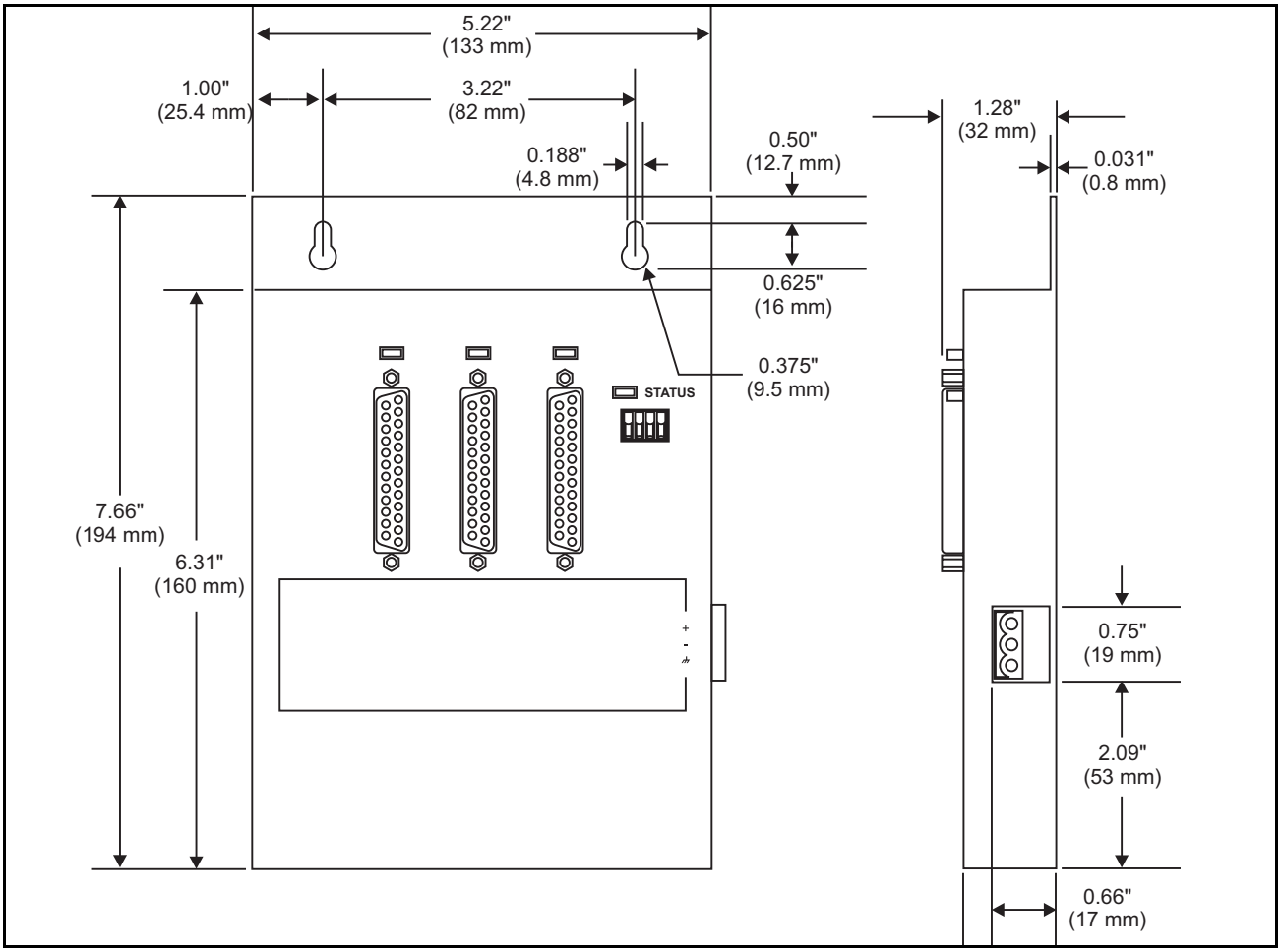


Figure 8.1 DTU3005B Device Dimensions

C.2 Power Requirements

The DTU3005 device requires a DC power supply of 7 to 35 VDC rated at 500 mA at 9 VDC. The power supply connector is provided with the device. The DTU3005 device can be powered from an off-the-shelf DC power supply. A 9 VDC power supply (part # 4000-0202) is available from Panel-Tec. The voltage polarity is marked on the front of the DTU3005 unit.

C.3 Connector Pinouts

All of the DTU3005B ports, 1 through 3, support both RS-232 and RS-422/485 signals. Connection should be made to one set of signals at a time. **Table C.1** contains the cable pinouts for the RS-422/485 connector. **Table C.2** contains the cable pinouts for the RS-232 connector.

Refer to **Appendix D** for cable connection diagrams for specific PLC devices.

Table C.1 RS-422/485 Connector Pinouts

Pin Number	Signal Name
16	CTS -
17	CTS +
18	RTS -
19	RTS +
21	TX -
22	RX -
23	TX +
24	RX +

Table C.2 RS-232 Connector Pinouts

Pin Number	Signal Name
1	FG - Frame Ground
2	TD - Transmit Data
3	RD - Receive Data
4	RTS - Request to Send
5	CTS - Clear to Send
7	SG - Signal Ground

D Cable Connection Diagrams

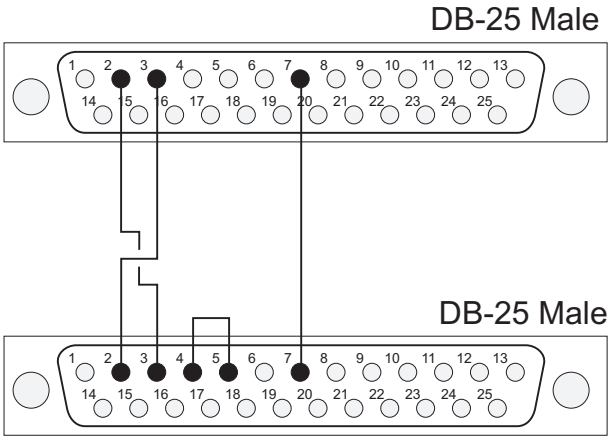
Allen Bradley PLC5

DTU 3005B

2	TXD
3	RXD
7	Ground

Allen Bradley
PLC5 Channel 0

2	TXD
3	RXD
4	RTS
5	CTS
7	Ground



Cable Type: 3 or 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

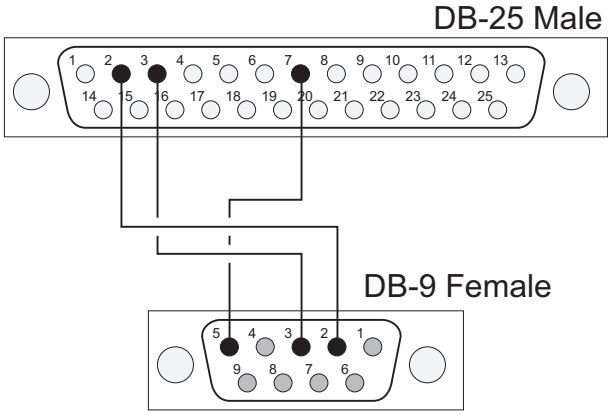
Allen Bradley SLC5/03 & 04

DTU 3005B

2	TXD
3	RXD
7	Ground

Allen Bradley
SLC5/03 & 04

2	RXD
3	TXD
5	Ground



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

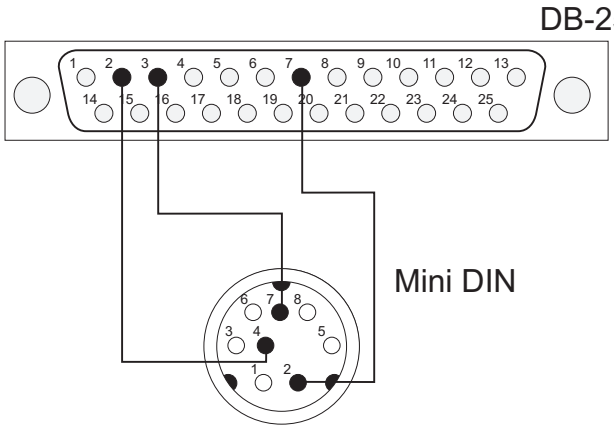
Allen Bradley Micrologix

DTU 3005B

2	TXD
3	RXD
7	Ground

Allen Bradley
MicroLogix

2	Ground
4	RXD
7	TXD



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

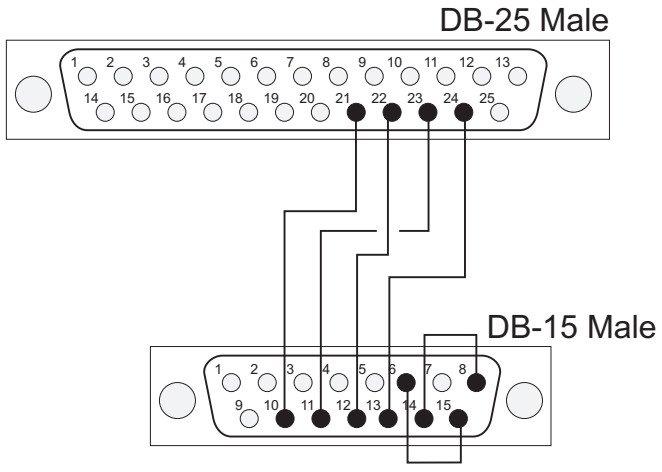
GE Fanuc 90/20, 30, 70

DTU 3005B

21	TX-
22	RX-
23	TX+
24	RX+

GE Fanuc
90/20, 30, 70

10	RDA
11	RDB
12	SDA
13	SDB



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

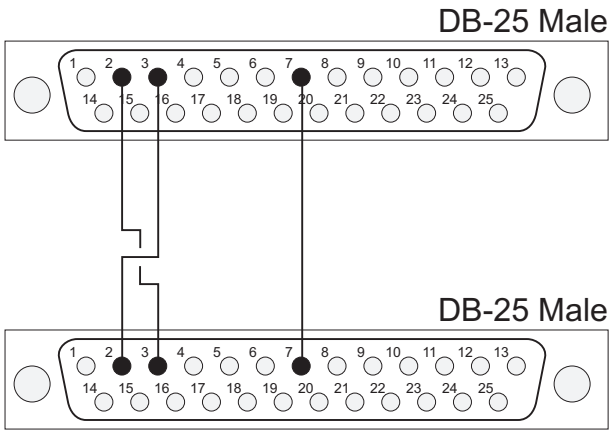
Idec FA with Link Adapter

DTU 3005B

2	TXD
3	RXD
7	Ground

Idec
FA with Link Adapter

2	TXD
3	RXD
7	Ground



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

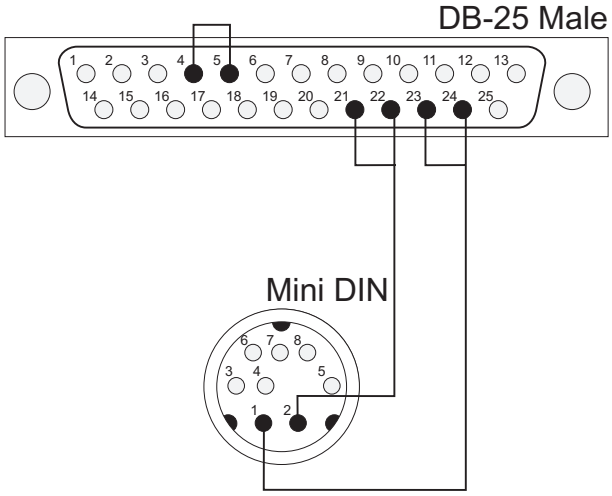
Idec Micro-3

DTU 3005B

4	RTS
5	CTS
21	TX-
22	RX-
23	TX+
24	RX+

Idec
Micro-3

1	D+
2	D-



Cable Type: 3 Conductor Round
2-Wire RS422 or RS485 Communications: **Yes**

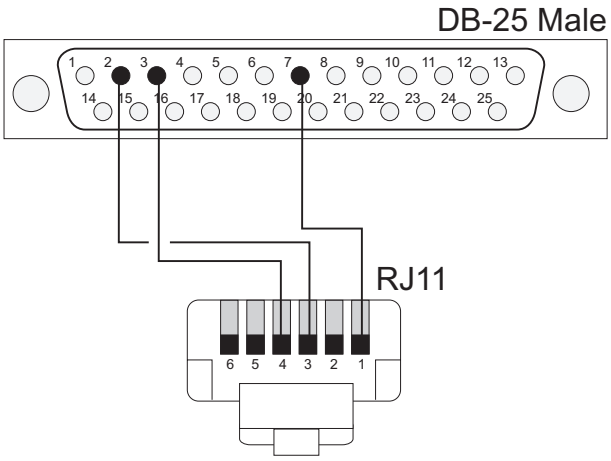
Koyo 205 (PLC Direct)

DTU 3005B

2	TXD
3	RXD
7	Ground

Koyo 205

1	Ground
3	RXD
4	TXD



Cable Type: Round Phone Cable
2-Wire RS422 or RS485 Communications: **No**

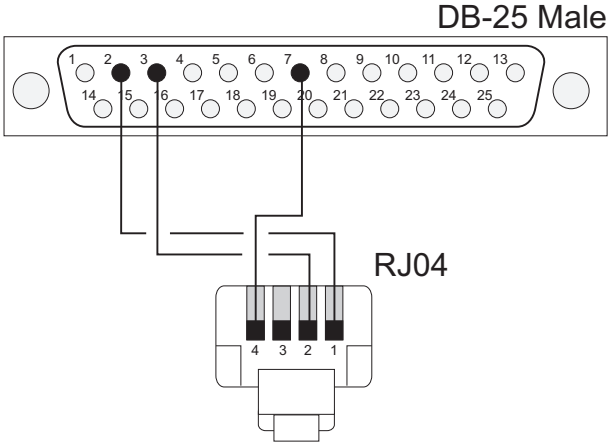
Koyo 305 (PLC Direct)

DTU 3005B

2	TXD
3	RXD
7	Ground

Koyo 305

1	RXD
2	TXD
4	Ground



Cable Type: Round Phone Cable
2-Wire RS422 or RS485 Communications: **No**

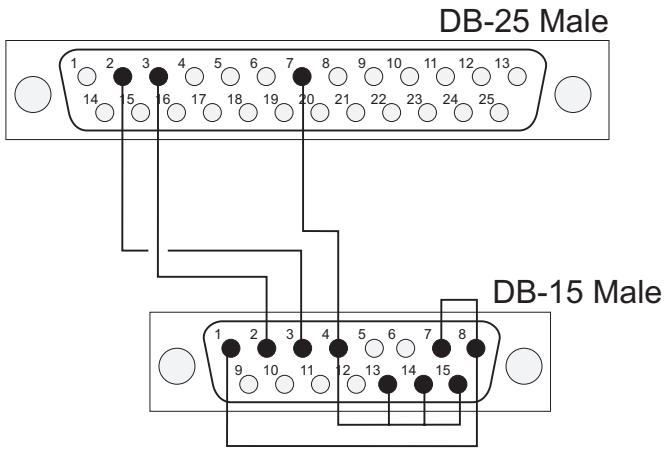
Koyo 405 (PLC Direct)

DTU 3005B

2	TXD
3	RXD
7	Ground

Koyo 405

2	TXD
3	RXD
4	Ground
13	
14	
15	



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

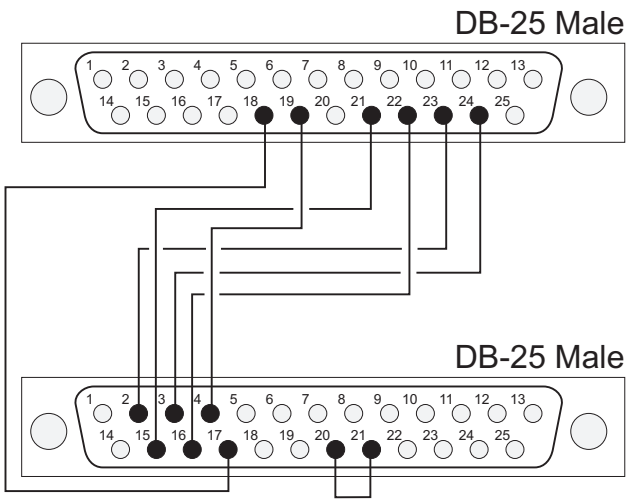
Mitsubishi FX

DTU 3005B

18	RTS-
19	RTS+
21	TX-
22	RX-
23	TX+
24	RX+

Mitsubishi FX

2	RX+
3	TX+
4	CTS+
15	RX-
16	TX-
17	CTS-



Cable Type: 6 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

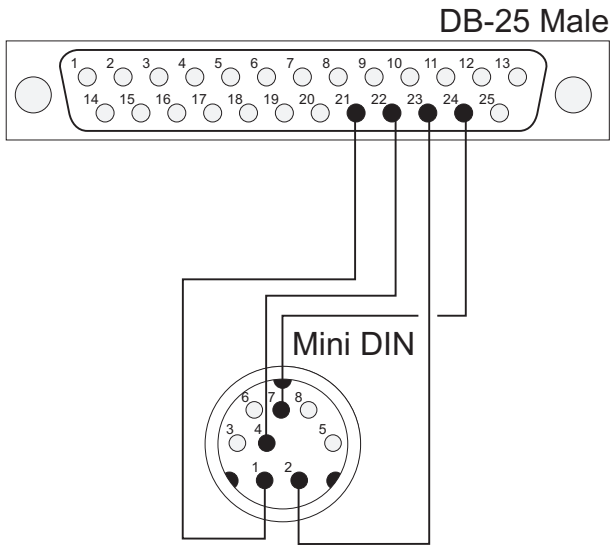
Mitsubishi FXo/FXon

DTU 3005B

21	TX-
22	RX-
23	TX+
24	RX+

Mitsubishi FXo/FXon

1	RX-
2	RX+
4	TX-
7	TX+



Cable Type: 3 or 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

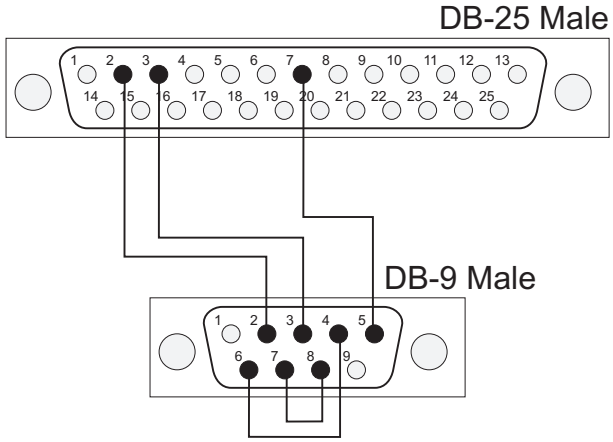
Modicon 984/Compact 984

DTU 3005B

2	TXD
3	RXD
7	Ground

Modicon 984/Compact 984

2	RXD
3	TXD
5	Ground



Cable Type: 3 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

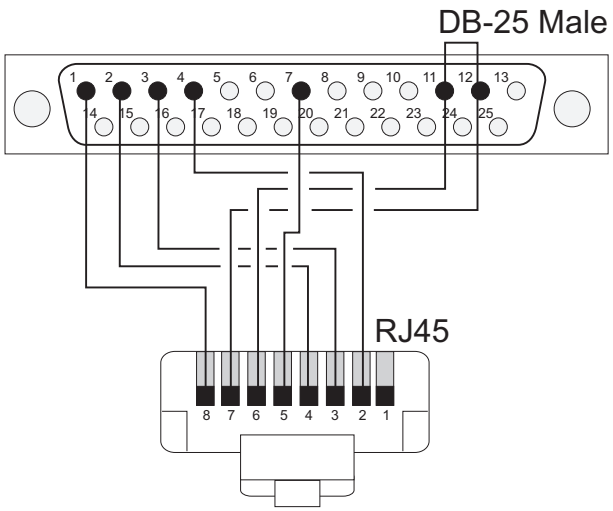
Modicon Micro 984

DTU 3005B

1	CGND
2	TXD
3	RXD
4	RTS
7	Ground

Modicon
Micro 984

2	CTS
3	TXD
4	RXD
5	Ground
8	CGND



Cable Type: Flat Phone Cable
2-Wire RS422 or RS485 Communications: **No**

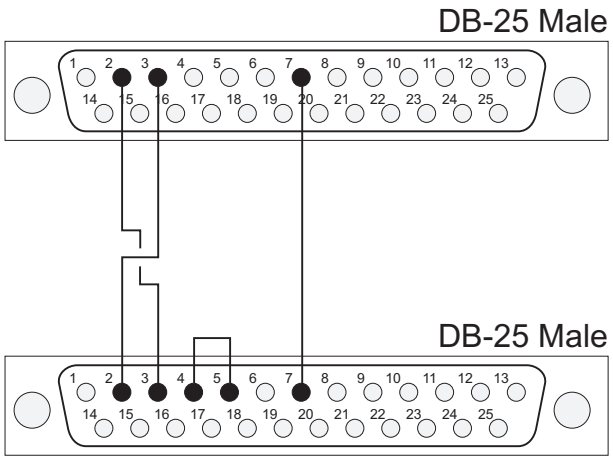
Omron 232 Host Link

DTU 3005B

2	TXD
3	RXD
7	Ground

Omron
232 Host Link

2	TXD
3	RXD
4	RTS
5	CTS
7	Ground



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

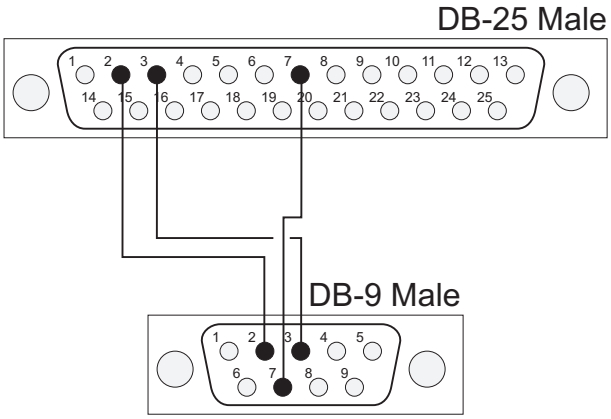
Omron C28H

DTU 3005B

2	TXD
3	RXD
7	Ground

Omron C28H

2	RXD
3	TXD
7	Ground



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

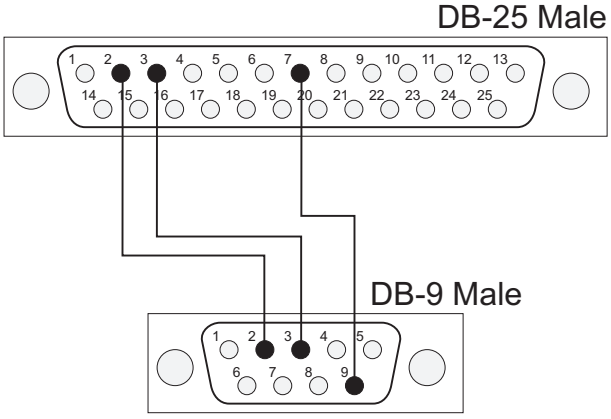
Omron CQM1

DTU 3005B

2	TXD
3	RXD
7	Ground

Omron CQM1

2	RXD
3	TXD
9	Ground

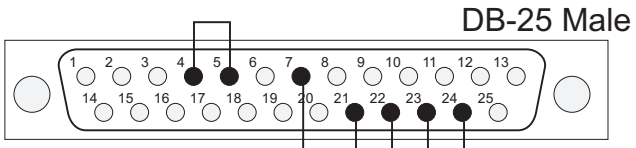


Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

Siemens S7

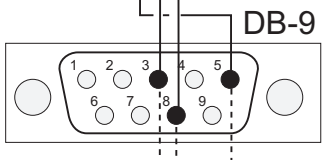
DTU 3005B

4	RTS
5	CTS
7	Ground
21	TX-
22	RX-
23	TX+
24	RX+



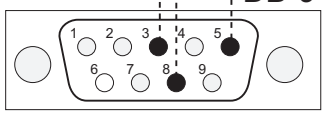
Siemens S7 PLC
or Motor Drive

3	D+
5	Ground
8	D-



Siemens S7 PLC
or Motor Drive
(Optional, Daisy Chained)

3	D+
5	Ground
8	D-

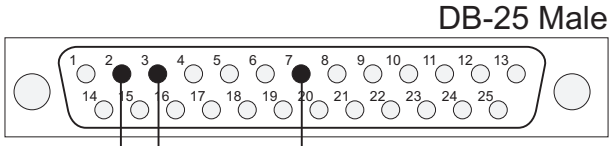


Cable Type: 3 or 4 Conductor Round
2-Wire RS422 or RS485 Communications: **Yes**

Simatic TI5 RS-232 Port

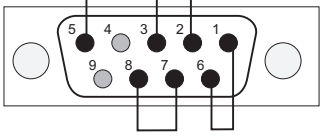
DTU 3005B

2	TXD
3	RXD
7	Ground



Simatic TI5
RS-232 Port

1	DCD
2	RXD
3	TXD
5	Ground
6	DSR
7	CTS
8	RTS



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

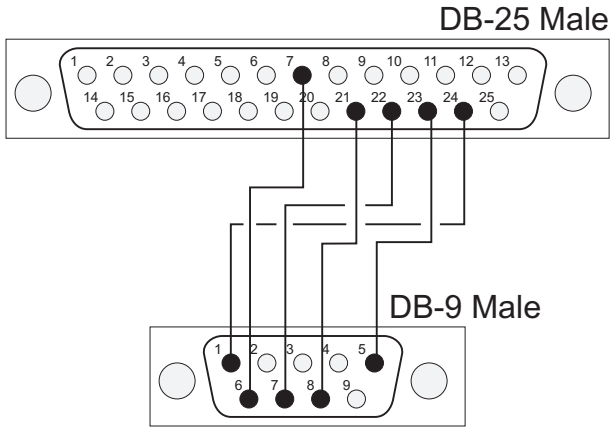
Simatic TI5 RS-422 Port

DTU 3005B

7	Ground
21	TX-
22	RX-
23	TX+
24	RX+

Simatic TI5
RS-422 Port

1	TX+
5	RX+
6	Ground
7	TX-
8	RX-



Cable Type: 6 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

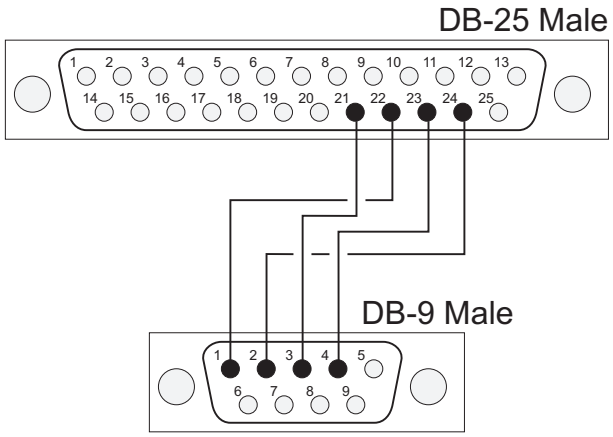
Square D Model 100-700 PLC

DTU 3005B

21	TX-
22	RX-
23	TX+
24	RX+

Square D
Model 100-700 PLC

1	TX-
2	TX+
3	RX-
4	RX+



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

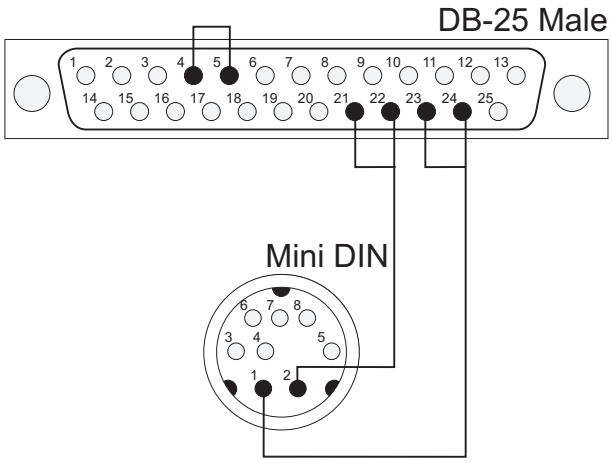
Square D TSX07

DTU 3005B

4	RTS
5	CTS
21	TX-
22	RX-
23	TX+
24	RX+

Square D
TSX07

1	D+
2	D-



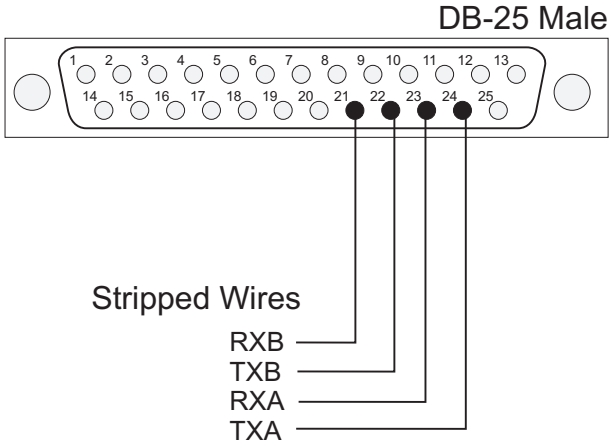
Cable Type: 3 or 4 Conductor Round
2-Wire RS422 or RS485 Communications: **Yes**

Toshiba EX & M Series

DTU 3005B

21	TX-
22	RX-
23	TX+
24	RX+

Toshiba
EX & M Series



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

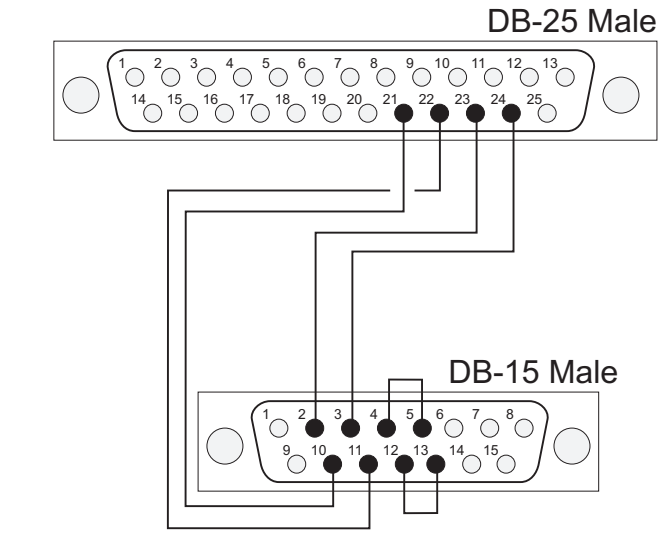
Toshiba T Series

DTU 3005B

21	TX-
22	RX-
23	TX+
24	RX+

Toshiba
T Series

2	RXA
3	TXA
4	CTSA
5	RTSA
10	RXB
11	TXB
12	CTSB
13	RTSB



Cable Type: 4 Conductor Round
2-Wire RS422 or RS485 Communications: **No**

E Device Data Format

This appendix contains the real-time device data and command registers for each of the supported Siemens devices.

E1 Device Type: SAMMS LV and MV

Real-Time Device Data Stored in PLC (SAMMS LV and MV)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Motor Run Time	0	0...65535 hours
# of Motor Starts	1	0...65535 starts
# of Trips	2	0...9999 trips
Time to Restart	3	0...3425 seconds
Winding Temperature	4	0...250 (% of Full Load)
LED & Contactors Note: When bit numbers are specified, Bit 15 is the highest order bit in the PLC register.	5	**Bit** **Contents** 15 Impending Trip LED 14 Incomplete Sequence LED 13 Overload Trip LED 12 Current Unbalance LED 11 External Trip LED 10 CPU Fault LED 9 Ground Fault LED 8 Contactor No. 3 7 Stop/Off LED (L1) 6 Forward/Low LED (L2) 5 Reverse/High LED (L3) 4 Hand LED 3 Off LED 2 Auto LED 1 Contactor No. 1 0 Contactor No. 2
Current Phase A	6—7	0.0001 amperes (10000 = 1 A)
Current Phase B	8—9	0.0001 amperes (10000 = 1 A)
Current Phase C	10—11	0.0001 amperes (10000 = 1 A)
Current Ground	12—13	0.0001 amperes (10000 = 1 A)
Note: In the above Current values (A, B, C, Ground), each one occupies two consecutive PLC registers. The low numbered PLC register contains the low order 16 bits and the higher numbered PLC register contains the high order 16 bits.		
Input Status and Pushbutton Status	14	**Bit** **Contents** 15 Not Used 14 Not Used 13 Remote Input No. 1 12 Remote Input No. 2 11 Remote Input No. 3 10 Remote Input No. 4 9 Spare 8 Not Used 7 Not Used 6 Not Used 5 Auto Button 4 Off Button 3 Hand Button 2 Left, Rev. Button 1 Start, On Button 0 Stop, Off Button
Timing Byte 1	15	0...200 seconds
Timing Byte 2	16	0...200 seconds
Overload Trip Class	17	2...23

Real-Time Device Data Stored in PLC (SAMMS LV and MV) (Continued)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Control Parameters	18	**Bit** **Contents** 7 Ground Fault Enable 6 Service Factor (0 = 1.0) 5 Auto Reset Enable 4 Phase Unbalance Enable 3 Emergency Reset Enable 2 Jam Protection Enable 1 Loss of Load Enable 0 Reserved
Ambient Temperature	19	0...70 Degrees C
Reserved	20 —23	For Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.

Device Command Data Retrieved From PLC (SAMMS LV and MV)

First Command Word (Command Word)	Second Command Word (Data or Value)
0 = No Command to Perform	Unused for Command 0
1 = Change Timing Byte 1	New value for timing byte 1 (0–200 seconds)
2 = Change Timing Byte 2	New value for timing byte 2 (0–200 seconds)
3 = Force Pushbutton On	**Pushbutton to force on** 1 = Stop/Off Button 2 = Start/On Button 3 = Left/Reverse Button 4 = Hand Button 5 = Off Button 6 = Auto Button 7 = Reserved for Later Use 8 = Reset after Trip
4 = Change Overload Trip	Overload Trip Class (2–23)
5 = Change Ground Fault	(0 = Warning, 1 = Protection Enabled)
6 = Change Phase Unbalance	(0 = Protection Disabled, 1 = Enabled)
7 = Change Ambient Temperature	Ambient Temperature (0–70)

E.2 Device Type: 4300 Power Meter

Real-Time Device Data Stored in PLC (4300 Power Meter)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Power Factor	0	0...1000, 0.1 percent
PF Lag/Lead	1	0 = Unity, 1 = Lag, 2 = Lead
Voltage L-N Phase A	2—3	0...999999 V
Voltage L-N Phase B	4—5	0...999999 V
Voltage L-N Phase C	6—7	0...999999 V
Voltage L-L Phase AB	8—9	0...999999 V
Voltage L-L Phase BC	10—11	0...999999 V
Voltage L-L Phase CA	12—13	0...999999 V
Current Phase A	14	0...65000 A
Current Phase B	15	0...65000 A
Current Phase C	16	0...65000 A
Kilowatts	17—18	-999999...999999 kW
Kilowatt Demand	19—20	-999999...999999 kW Max
Maximum Kilowatt Demand	21—22	-999999...999999 kW
Kilowatt Hours (net)	23—24	-999999999...999999999 kWH
Frequency	25	0...32767, 0.1 Hz
Kilovolt-Amperes	26—27	0...999999 kVA
Kilovolt-Amperes Reactive	28—29	0...999999 kVAR
Reserved	30—33	For Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.

Device Command Data Retrieved From PLC (4300 Power Meter)

First Command Word (Command Word)	Second Command Word (Data or Value)
0 = No Command to Perform	Unused for Command 0
1 = Reset Max Kilowatt Demand	Unused for Command 1
2 = Reset Kilowatt Hours	Unused for Command 2

E.3 Device Type: 4700 Power Meter

Real-Time Device Data Stored in PLC (4700 Power Meter)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Voltage L-N Phase A	0—1	0...999999 V
Voltage L-N Phase B	2—3	0...999999 V
Voltage L-N Phase C	4—5	0...999999 V
Voltage L-L Phase AB	6—7	0...999999 V
Voltage L-L Phase BC	8—9	0...999999 V
Voltage L-L Phase CA	10—11	0...999999 V
Current Phase A	12	0...9999 A
Current Phase B	13	0...9999 A
Current Phase C	14	0...9999 A
Current N (I4)	15	0...9999 A
Kilowatts	16—17	-999999...999999 kW
Kilovolt-Amperes Reactive	18—19	0...999999 kVAR
Kilowatt Demand	20—21	-999999...999999 kW
Power Factor	22	60.....100
PF Lag/Lead	23	0 = Unity, 1 = Lag, 2 = Lead
Frequency	24	400...700, 0.1 Hz
Auxiliary Voltage	25—26	0...999999 V
Average Current Demand	27	0...9999 A
Kilowatt Hours (forward)	28—29	0...1,000,000,000 kWH
Kilowatt Hours (reverse)	30—31	0...1,000,000,000 kWH
Kilovolt-Amperes Reactive Hours (Total)	32—33	0...999999 kVARH
Kilovolt-Amperes (Total)	34—35	0...999999 kVA
Input/Output Status Note: When bit numbers are specified, Bit 15 is the highest order bit in the PLC register.	36	**Bit** **Contents** 15 Discrete Input S3 (1 = On) 14 Discrete Input S2 (1 = On) 13 Discrete Input S1 (1 = On) 12 Relay 3 (1 = Closed) 11 Relay 2 (1 = Closed) 10 Relay 1 (1 = Closed) 9 Not Used 8 Setpoint 17 Reached 7 Not Used 6 Not Used 5 Flag New Snapshot 4 Flag Diagnostic Fail 3 Flag New Min/Max 2 Flag New Event 1 Flag Alarm Status Change 0 Discrete Input S4 (1 = On)
Reserved	37—41	For Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.

Device Command Data Retrieved From PLC (4700 Power Meter)

First Command Word (Command Word)	Second Command Word (Data or Value)
0 = No Command to Perform	Unused for Command 0
1 = Reset all Demand Min/Max	Unused for Command 1
2 = Reset kW and kVAR Hours	Unused for Command 2
3 = Close Relay	Relay Number (1–3)
4 = Open Relay	Relay Number (1–3)

E.4 Device Type: 4720 Power Meter

Real-Time Device Data Stored in PLC (4720 Power Meter)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Voltage L-N Phase A	0–1	0...99999999 V
Voltage L-N Phase B	2–3	0...99999999 V
Voltage L-N Phase C	4–5	0...99999999 V
Voltage L-L Phase AB	6–7	0...99999999 V
Voltage L-L Phase BC	8–9	0...99999999 V
Voltage L-L Phase CA	10–11	0...99999999 V
Auxiliary Voltage	12–13	0...999999 V
Current Phase A	14	0...9999 A
Current Phase B	15	0...9999 A
Current Phase C	16	0...9999 A
Current N (I4)	17	0...9999 A
Current Demand Phase A	18	0...9999 A
Current Demand Phase B	19	0...9999 A
Current Demand Phase C	20	0...9999 A
Kilowatts	21–22	-99999999...99999999 kW
Kilowatt Demand	23–24	-99999999...99999999 kW
Kilowatt Hours (total)	25–26	0...1,000,000,000 kWH
Kilowatt Hours (reverse)	27–28	0...1,000,000,000 kWH
Kilovolt-Amperes Reactive	29–30	0...999999 kVAR
Power Factor	31	0...100
PF Lag/Lead	32	0 = Unity, 1 = Lag, 2 = Lead
Frequency	33	0...6000, 0.01 Hz
Current I1 HD - Total	34	0...9999 A
Current I2 HD - Total	35	0...9999 A
Current I3 HD - Total	36	0...9999 A
Voltage VI HD - Total	37–38	0...99999999 V
Voltage V2 HD - Total	39–40	0...99999999 V
Voltage V3 HD - Total	41–42	0...99999999 V
Sliding Win Kilowatt Demand	43–44	0...99999999 kW
Predicted Slide Win Kilowatt	45–46	0...99999999 kW
Kilovolt-Amperes (Total)	47–48	0...99999999 kVA
Kilovolt-Amperes Reactive Hours (Total)	49–50	0...99999999 kVARH
Input Status	51	Bits 0–3: Inputs 1–4
Relay Status	52	Bits 0–2: Relays 1–3
Reserved	53–57	Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.

Device Command Data Retrieved From PLC (4720 Power Meter)

First Command Word (Command Word)	Second Command Word (Data or Value)
0 = No Command to perform	Unused for Command 0
1 = Reset all Demand Min/Max	Unused for Command 1
2 = Reset all Hours Counters	Unused for Command 2
3 = Close Relay	Relay Number (1–3)
4 = Open Relay	Relay Number (1–3)

E.5 Device Type: Static Trip III

Real-Time Device Data Stored in PLC (Static Trip III)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Current Phase A	0	0...65000 A
Current Phase B	1	0...65000 A
Current Phase C	2	0...65000 A
Current Ground	3	0...65000 A
Voltage L-N Phase A	4	0...400 V
Voltage L-N Phase B	5	0...400 V
Voltage L-N Phase C	6	0...400 V
Voltage L-L Phase AB	7	0...660 V
Voltage L-L Phase BC	8	0...660 V
Voltage L-L Phase CA	9	0...660 V
Kilowatts	10	-32000...32000 kW
Kilowatt Demand	11	-32000...32000 kW
Kilowatt Hours (Total)	12–13	-9999999...9999999 kWH
Kilowatt Hours (Reverse)	14–15	-9999999...0 kWH
Kilovolt-Amperes Reactive	16	-32000...32000 kVAR
Power Factor	17	-100..100
Frequency	18	400...700, 0.1 Hz
Breaker Counter	19	0...65000 cycles
Comm Status Note: When bit numbers are specified, Bit 15 is the highest order bit in the PLC register.	20	**Bit** **Contents** 15 Breaker failed to open 14 Comm Trip Brkr active 13 Current unbal. pickup 12 Comm Phase Unbalance 11 Comm Close Brkr active 10 Digital Shadow Protect 9 Max Data Activity 8 Breaker Pos (1 = closed) 7 Reverse Power pickup 6 Over Frequency pickup 5 Under Frequency pickup 4 Overvoltage pickup 3 Undervoltage pickup 2 Voltage unbal. pickup 1 Remote Trip 0 Min Data Activity
Breaker Status	21	**Bit** **Contents** 15 ST UP Disabled Target 14 Long-time Overload 13 Short Circuit Target 12 Ground Fault Target 11 Voltage Unbal. Target 10 Zone Interlock Out 9 Current Unbal. Target 8 Long-time Pickup 7 Reverse Power Target 6 Over Frequency Target 5 Under Frequency Target 4 Overvoltage Target 3 Undervoltage Target 2 Instantaneous Bypass 1 ST Local Cmd to Trip 0 Static Trip Reset

Real-Time Device Data Stored in PLC (Static Trip III) (Continued)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Alarm Status	22	**Bit** **Contents** 15 Overvoltage Setpoint 14 Voltage Unbalance Setpoint 13 Undervoltage Setpoint 12 Current Unbalance Setpoint 11 Neutral Overcurrent 10 Ground Overcurrent 9 Overcurrent Setpoint 8 Aux. Relay Closed 7 New Data in Alarm Log 6 Not Used 5 Not Used 4 Processor Error 3 Energy Value Overflow 2 EEPROM Data Corrupted 1 Function Range Error 0 Calibration Error
Reserved	23—25	For Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.

Device Command Data Retrieved From PLC (Static Trip III)

First Command Word (Command Word)	Second Command Word (Data or Value)
0 = No Command to Perform	Unused for Command 0
1 = Reset Kilowatt Demand	Unused for Command 1
2 = Reset Kilowatt Hours (Total and Reverse)	Unused for Command 2
3 = Close Breaker	Unused for Command 3
4 = Open Breaker	Unused for Command 4
5 = Clear Targets and Trip Status	Unused for Command 5
6 = Close Auxilliary Contact	Unused for Command 6
7 = Open Auxilliary Contact	Unused for Command 7

E.6 Device Type: SensiTrip III

Real-Time Device Data Stored in PLC (SensiTrip III)

Real-Time Data	Register Offset	Range or Contents
MT Status	0	2 Byte ASCII string
Zone Interlock Status	1	High Order Byte: Ground Fault Zone Low Order Byte: Short Time Zone
Device Type	2	00h = No Device 01h = MCCB/ICCB 02h = STIIIC/CP
Phase A Current (Gain Off)	3	0...65535 (must be scaled)
Phase B Current (Gain Off)	4	0...65535 (must be scaled)
Phase C Current (Gain Off)	5	0...65535 (must be scaled)
Ground Fault Current (Gain Off)	6	0...65535 (must be scaled)
Phase A Current (Gain On)	7	0...65535 (must be scaled)
Phase B Current (Gain On)	8	0...65535 (must be scaled)
Phase C Current (Gain On)	9	0...65535 (must be scaled)
Ground Fault Current (Gain On)	10	0...65535 (must be scaled)
Phase A Temperature	11	(not defined currently)
Phase B Temperature	12	(not defined currently)
Phase C Temperature	13	(not defined currently)
Breaker Status	14	2 Byte ASCII string
Configuration Switch	15	Switch setting (0...255)
Continuous Current Switch	16	Switch setting (0...255)
Long Time Delay Switch	17	Switch setting (0...255)
Instantaneous Pickup Switch	18	Switch setting (0...255)
Short Time Pickup Switch	19	Switch setting (0...255)
Short Time Delay Switch	20	Switch setting (0...255)
Ground Fault Pickup Switch	21	Switch setting (0...255)
Ground Fault Delay Switch	22	Switch setting (0...255)
Trip Unit Frame Type Code	23	ASCII character code MCCB Types: J, L, M, N, P SB Types: S
Trip Unit Frame Rating Code	24	2 Byte ASCII string
Display Module Type	25	00h = None 01h = Load Monitor 02h = Ground Fault Monitor
Display Module Switch	26	Switch setting (00...09)
MTA Software Version	27	0100h-0999h (0100h=Version 1.00)
Device Software Version	28	0100h-0999h (0100h=Version 1.00)
Reserved	29-33	For Future Expansion

Note: No Commands from this device are supported.

E.7 Device Type: SB-TL

Real-Time Device Data Stored in PLC (SB-TL)

Real-Time Data	Register Offset	Range or Contents
MT Status	0	2 Byte ASCII string
Zone Interlock Status	1	High Order Byte: Ground Fault Zone Low Order Byte: Short Time Zone
Device Type	2	00h = No Device 01h = MCCB/ICCB 02h = STIIIC/CP
Phase A Current (Gain Off)	3	0...65535 (must be scaled)
Phase B Current (Gain Off)	4	0...65535 (must be scaled)
Phase C Current (Gain Off)	5	0...65535 (must be scaled)
Ground Fault Current (Gain Off)	6	0...65535 (must be scaled)
Phase A Current (Gain On)	7	0...65535 (must be scaled)
Phase B Current (Gain On)	8	0...65535 (must be scaled)
Phase C Current (Gain On)	9	0...65535 (must be scaled)
Ground Fault Current (Gain On)	10	0...65535 (must be scaled)
Phase A Temperature	11	(not defined currently)
Phase B Temperature	12	(not defined currently)
Phase C Temperature	13	(not defined currently)
Breaker Status	14	2 Byte ASCII string
Configuration Switch	15	Switch setting (0...255)
Continuous Current Switch	16	Switch setting (0...255)
Long Time Delay Switch	17	Switch setting (0...255)
Instantaneous Pickup Switch	18	Switch setting (0...255)
Short Time Pickup Switch	19	Switch setting (0...255)
Short Time Delay Switch	20	Switch setting (0...255)
Ground Fault Pickup Switch	21	Switch setting (0...255)
Ground Fault Delay Switch	22	Switch setting (0...255)
Trip Unit Frame Type Code	23	ASCII character code MCCB Types: J, L, M, N, P SB Types: S
Trip Unit Frame Rating Code	24	2 Byte ASCII string
Display Module Type	25	00h = None 01h = Load Monitor 02h = Ground Fault Monitor
Display Module Switch	26	Switch setting (00...09)
MTA Software Version	27	0100h-0999h (0100h=Version 1.00)
Device Software Version	28	0100h-0999h (0100h=Version 1.00)
Reserved	29-33	For Future Expansion

Note: No Commands from this device are supported.

E.8 Device Type: Pulse Reading Meter (PRM)

Real-Time Device Data Stored in PLC (PRM)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Instantaneous kW	0-1	0...4294967295 kW
kW demand (30 minutes)	2-3	0...4294967295 kW
Peak kW (30 minutes)	4-5	0...4294967295 kW
kW Hours	6-7	0...4294967295 kWh
kW demand (5 minutes)	8-9	0...4294967295 kW
New Snapshot Since Last	10	0 = No, 1 = Yes
Minutes Between Snaps	11	5, 30 minutes
Max Number of Snaps	12	1...65535 (snaps x 12)
Number of Hours Ago	13	0...65535 hours
Snapshot Year	14	0...99 (Modulo 100)
Snapshot Month	15	1..12 Month
Snapshot Day	16	1...31 Day
Snapshot Hours	17	0...23 Hours
Snapshot Minutes	18	0...59 Minutes
Snapshot Seconds	19	0...59 Seconds
Snapshot (most recent)	20-21	0...4294967295 kW
Snapshot	22-23	0...4294967295 kW
Snapshot	24-25	0...4294967295 kW
Snapshot	26-27	0...4294967295 kW
Snapshot	28-29	0...4294967295 kW
Snapshot	30-31	0...4294967295 kW
Snapshot	32-33	0...4294967295 kW
Snapshot	34-35	0...4294967295 kW
Snapshot	36-37	0...4294967295 kW
Snapshot	38-39	0...4294967295 kW
Snapshot	40-41	0...4294967295 kW
Snapshot (least recent)	42-43	0...4294967295 kW
1/1000 kWh Per Pulse	44	0...65535 (0.000 kWh)
Reserved	45-49	For Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.

Device Command Data Retrieved From PLC (Pulse Reading Meter)

First Command Word (Command Word)	Second Command Word (Data or Value)
0 = No Command to Perform	Unused for Command 0
1 = Clear Kilowatt Hours	Unused for Command 1
2 = Clear Peak kW Demand	Unused for Command 2
3 = Set kW Hours Per Pulse	1/1000 kWh Per Pulse (in 0.001 kWh)

E.9 Device Type: ISGS

Real-Time Device Data Stored in PLC (ISGS)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Current Phase A	0	0...32000 A
Current Phase B	1	0...32000 A
Current Phase C	2	0...32000 A
Current Neutral	3	0...32000 A
Current Demand Phase A	4	0...32000 A
Current Demand Phase B	5	0...32000 A
Current Demand Phase C	6	0...32000 A
Voltage L-N Phase A	7–8	0...9999999 V
Voltage L-N Phase B	9–10	0...9999999 V
Voltage L-N Phase C	11–12	0...9999999 V
Voltage L-L Phase AB	13–14	0...9999999 V
Voltage L-L Phase BC	15–16	0...9999999 V
Voltage L-L Phase CA	17–18	0...9999999 V
Kilowatts	19–20	0...1000000000 kW
Kilowatt Demand	21–22	0...1000000000 kW
Kilowatt Hours (Total)	23–24	0...1000000000 kWH
Kilovolt-Amperes Reactive	25–26	0...1000000000 kVAR
Power Factor	27	-100...100
Frequency	28	0...32000, 0.1 Hz
Input/Output Status Note: When bit numbers are specified, Bit 15 is the highest order bit in the PLC register.	29	**Bit** **Contents** 15 Input 4 (BI4) Status 14 Input 3 (BI3) Status 13 Input 2 (BI2) Status 12 Input 1 (BI1) Status 11 Breaker Pos Error 10 Trip Source Impedance 9 Trip Solenoid Status 8 Breaker Pos (1 = Open) 7 Output 2 (BO2) Status 6 Output 1 (BO1) Status 5 Trip 3 Status 4 Trip 2 Status 3 Trip 1 Status 2 Relay Trip LED 1 Device in Pickup 0 Relay Fail Asserted
Breaker Operations	30	0...65535 Operations Reserved
Reserved	31–35	For Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.

Device Command Data Retrieved From PLC (ISGS Switchgear)

First Command Word (Command Word)	Second Command Word (Data or Value)
0 = No Command to Perform	Unused for Command 0
1 = Clear Min/Max Log	Unused for Command 1
2 = Reset Kilowatt and Kilovolt-Amperes Reactive Hours	Unused for Command 2
3 = Assert Comm Event[1]	Comm Event to Assert (1–5)
4 = Release Comm Event[1]	Comm Event to Release (1–5)
5 = Reset Local Targets	Unused for Command 5
6 = Reset Breaker Operation	Unused for Command 6
7 = Reset Interrupted Current	Unused for Command 7

1. Communications events can be programmed on the ISGS unit to trip or close the circuit breaker, operate an output contact, or activate a binary input. Refer to the *ISGS Operator's Manual* (SGIM-8158A) for information on programming communications events.

E.10 Device Type: Sentron SB Energy Comm Trip Unit

Real-Time Device Data Stored in PLC (Energy/Comm)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Current Phase A	0	0...65535 A
Current Phase B	1	0...65535 A
Current Phase C	2	0...65535 A
Current Ground	3	0...65535 A
Voltage L-N Phase A	4	0...65535 V
Voltage L-N Phase B	5	0...65535 V
Voltage L-N Phase C	6	0...65535 V
Voltage L-L Phase AB	7	0...65535 V
Voltage L-L Phase BC	8	0...65535 V
Voltage L-L Phase CA	9	0...65535 V
Instantaneous Watts	10–11	0...4294967293 W
Instantaneous Watts Units	12	0 = Watts, 1 = kW, 2 = mW
Instantaneous Watts Direction	13	0 = Reverse, 1 = Forward
Instantaneous Volts-Amps Reactive	14–15	0...4294967293 VAR
Instantaneous Volts-Amps Reactive Units	16	0 = VAR, 1 = kVAR, 2 = mVAR
Instantaneous Volts-Amps Reactive Direction	17	0 = Reverse, 1 = Forward
Instantaneous Volts-Amps	18–19	0...4294967293 VA
Instantaneous Volts-Amps Units	20	0 = VA, 1 = kVA, 2 = mVA
Amps Demand	21	0...65535 A rms
Watts Demand	22–23	0...4294967293 W
Watts Demand	24	0 = Watts, 1 = kW, 2 = mW
Watts Demand Direction	25	0 = Reverse, 1 = Forward
Forward Watt Hours	26–27	0...4294967293 W
Forward Watt Hours Units	28	0 = Watts Hrs, 1 = kWH, 2 = mWH
Reverse Watt Hours	29–30	0...4294967293 W
Reverse Watt Hours Units	31	0 = Watts Hrs, 1 = kWH, 2 = mWH
Forward Volts-Amps Reactive Hours	32–33	0...4294967293
Forward Volts-Amps Reactive Hours Units	34	0 = VAR Hrs, 1 = kVARH, 2 = mVARH
Reverse Volts-Amps Reactive Hours	35–36	0...4294967293 VAR
Reverse VAR Hours Units	37	0 = VAR Hrs, 1 = kVARH, 2 = mVARH
Power Factor Phase A	38	0...100, 0.01%
PF Phase A Direction	39	0 = Lead, 1 = Lag
Power Factor Phase B	40	0...100, 0.01%
PF Phase B Direction	41	0 = Lead, 1 = Lag
Power Factor Phase C	42	0...100, 0.01%
PF Phase C Direction	43	0 = Lead, 1 = Lag
Frequency	44	400...700, 0.1 Hz
Breaker Position	45	0 = Open, 1 = Closed

Real-Time Device Data Stored in PLC (Energy/Comm) (Continued)

Real-Time Data	Register Location in PLC Block [1]	Range or Contents
Alarm Function Status Note: When bit numbers are specified, Bit 15 is the highest order bit in the PLC register.	46	**Bit** **Contents** 15–10 Unused 9 Harmonic Distortion Alarm 8 Under PF Lag Alarm 7 Over PF Lead Alarm 6 Over kVAR Alarm 5 Over kVA Alarm 4 Over kW Demand Alarm 3 Over kW Alarm 2 Over Amp Demand Alarm 1 Grnd Over Amp Alarm 0 Over Amp Alarm
Protective Relay Status	47	**Bit** **Contents** 15–8 Unused 7 Under Frequency Alarm 6 Over Frequency Alarm 5 Over Reverse kW Alarm 4 Overvoltage Alarm 3 Voltage Unbalanced Alarm 2 Undervoltage Alarm 1 Current Unbalanced Alarm 0 Neutral Over Amp Alarm
Event Counter	48	0...65535
System Error Flag	49	0 = No System Errors 1 = EEPROM Write Error 2 = Status Update Error 3 = Clear Trip Log Error 4 = Trip Log Entry Error 5 = Breaker Test Error 6 = Trip Error
THD Phase A	50	0-100
THD Phase B	51	0-100
THD Phase C	52	0-100
THD Neutral	53	0-100

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.

Device Command Data Retrieved From PLC (Energy/Comm)

First Command Word (Command Word)	Second Command Word (Data or Value)
0 = No Command to Perform	Unused for Command 0
1 = Reset All Demand Values	Unused for Command 1
2 = Reset All Hour Counters	Unused for Command 2
3 = Close Breaker	Unused for Command 3
4 = Open Breaker	Unused for Command 4

E.11 Device Type: S7-I/O

Real-Time Device Data Stored in PLC (S7-I/O)

Function	Register Location in PLC Block [1]	Range or Contents
Inputs 1–16	0	Bits 0–15:
Inputs 17–32	1	Bits 0–15:
Inputs 18–48	2	Bits 0–15:
Inputs 49–64	3	Bits 0–15:
Outputs 1–16	4	Bits 0–15:
Outputs 17–32	5	Bits 0–15:
Outputs 18–48	6	Bits 0–15:
Outputs 49–64	7	Bits 0–15:
Event Counter 1	8	I0.0 Event Counter
Event Counter 2	9	I0.1 Event Counter
Event Counter 3	10	I0.2 Event Counter
Event Counter 4	11	I0.3 Event Counter
Event Counter 5	12	I0.4 Event Counter
Event Counter 6	13	I0.5 Event Counter
Event Counter 7	14	I0.6 Event Counter
Event Counter 8	15	I0.7 Event Counter
Event Counter (Total)	16	Total Event Counter
Reserved	17–21	For Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.

Device Command Data Retrieved From PLC (S7-I/O)

First Command Word (Command Word)	Second Command Word (Data or Value)
0 = No Command to Perform	Unused for Command 0
1 = Clear Event Counter (s)	**Event Counter to Clear** 1 = Event Counter 1 2 = Event Counter 2 3 = Event Counter 3 4 = Event Counter 4 5 = Event Counter 5 6 = Event Counter 6 7 = Event Counter 7 8 = Event Counter 8 255 = All Event Counters
2 = Turn Output On	Output Number (1–64)
3 = Turn Output Off	Output Number (1–64)

E.12 Device Type: 7SA511

Real-Time Device Data Stored in PLC (7SA511)

Function	Register Location in PLC Block [1]	Range or Contents
Current Phase A (I_{L1})	0	%
Current Phase B (I_{L2})	1	%
Current Phase C (I_{L3})	2	%
Voltage L-N Phase A ($U_{L1}E$)	3	%
Voltage L-N Phase B ($U_{L2}E$)	4	%
Voltage L-N Phase C ($U_{L2}E$)	5	%
Watts Three-phase (Pa)	6	%
VAR Three-phase (Pr)	7	%
Frequency (f)	8	%
Voltage L-L Phase AB (U_{L12})	9	%
Voltage L-L Phase BC (U_{L23})	10	%
Voltage L-L Phase CA (U_{L31})	11	%
I_{ea}	12	mA
I_{er}	13	mA
General Status Word 1[2]	14	**Bit** **Contents** 15 Setting group C is active (Valid) 14 Setting group C is active (Status) 13 Setting group B is active (Valid) 12 Setting group B is active (Status) 11 Setting group A is active (Valid) 10 Setting group A is active (Status) 9 Device operative/healthy (Valid) 8 Device operative/healthy (Status) 7 >User defined annunciation 4 (Valid) 6 >User defined annunciation 4 (Status) 5 >User defined annunciation 3 (Valid) 4 >User defined annunciation 3 (Status) 3 >User defined annunciation 2 (Valid) 2 >User defined annunciation 2 (Status) 1 >User defined annunciation 1 (Valid) 0 >User defined annunciation 1 (Status)
General Status Word 2[2]	15	**Bit** **Contents** 15 Earth fault (isol./comp.) reverse dir (Valid) 14 Earth fault (isol./comp.) reverse dir (Status) 13 Earth fault (isol./comp.) forward dir (Valid) 12 Earth fault (isol./comp.) forward dir (Status) 11 >U Line side VT MCB tripped (Valid) 10 >U Line side VT MCB tripped (Status) 9 Failure: Phase sequence supervision (Valid) 8 Failure: Phase sequence supervision (Status) 7 Measured value supervision of voltages (Valid) 6 Measured value supervision of voltages (Status) 5 Measured value supervision of currents (Valid) 4 Measured value supervision of currents (Status) 3 General internal failure of device (Valid) 2 General internal failure of device (Status) 1 Setting group D is active (Valid) 0 Setting group D is active (Status)

Real-Time Device Data Stored in PLC (7SA511) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
General Status Word 3[2]	16	**Bit** **Contents** 6–15 Not used 5 Dist. teleprotection: Carrier faulty (Valid) 4 Dist. teleprotection: Carrier faulty (Status) 3 AR: Auto-reclose is not ready (Valid) 2 AR: Auto-reclose is not ready (Status) 1 Emergency O/C protection is running (Valid) 0 Emergency O/C protection is running (Status)
Number of last fault	17	0…32767, 0 = no faults
Fault Date/Time (ms)	18	0…59999 (ms)
Fault Date/Time (h/m)	19	High byte: HH (0…23), Low byte: MM (0…59)
Fault Date/Time (m/d)	20	High byte: MM (1…12); Low byte: DD (1…31)
Fault Date/Time (y)	21	Year: YY (00…99)
Interrupted current: Phase L1 (I/I_n)	22	ms since fault (-1 = no occurance)
Interrupted current: Phase L1 (I/I_n)	23	Low word
Interrupted current: Phase L1 (I/I_n)	24	High word
Interrupted current: Phase L2 (I/I_n)	25	ms since fault (-1 = no occurance)
Interrupted current: Phase L2 (I/I_n)	26	Low word
Interrupted current: Phase L2 (I/I_n)	27	High word
Interrupted current: Phase L3 (I/I_n)	28	ms since fault (-1 = no occurance)
Interrupted current: Phase L3 (I/I_n)	29	Low word
Interrupted current: Phase L3 (I/I_n)	30	High word
Fault Resistance, Ohm Prim.	31	ms since fault (-1 = no fault)
Fault Resistance, Ohm Prim.	32	Low word
Fault Resistance, Ohm Prim.	33	High word
Fault Reactance, Ohm Prim.	34	ms since fault (-1 = no fault)
Fault Reactance, Ohm Prim.	35	Low word
Fault Reactance, Ohm Prim.	36	High word
Fault Resistance, Ohm Sec.	37	ms since fault (-1 = no fault)
Fault Resistance, Ohm Sec.	38	Low word
Fault Resistance, Ohm Sec.	39	High word
Fault Reactance, Ohm Sec.	40	ms since fault (-1 = no fault)
Fault Reactance, Ohm Sec.	41	Low word
Fault Reactance, Ohm Sec.	42	High word
Distance to fault in km	43	ms since fault (-1 = no fault)
Distance to fault in km	44	Low word
Distance to fault in km	45	High word
Distance to fault in %	46	ms since fault (-1 = no fault)
Distance to fault in %	47	Low word
Distance to fault in %	48	High word

Real-Time Device Data Stored in PLC (7SA511) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Fault in the power system	49	ms since fault (-1 = no fault)
General Trip for Fault in Forward Direction	50	ms since fault (-1 = no occurance)
General Trip for Fault in Reverse Direction	51	ms since fault (-1 = no occurance)
Trip by earth fault det. (isol./comp.)	52	ms since fault (-1 = no occurance)
Trip by earth fault protection	53	ms since fault (-1 = no occurance)
Carrier Transmission for dir. Comp. E/F	54	ms since fault (-1 = no occurance)
Transient Block. Of E/F protection	55	ms since fault (-1 = no occurance)
Trip by thermal overload protection	56	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L1 only	57	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L1E	58	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L2 only	59	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L2E	60	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L12	61	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L12E	62	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L3 only	63	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L3E	64	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L13	65	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L13E	66	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L23	67	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L23E	68	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L123	69	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L123E	70	ms since fault (-1 = no occurance)
Emerg. O/C protection: General Trip	71	ms since fault (-1 = no occurance)
AR: Close command from auto-reclose	72	ms since fault (-1 = no occurance)
Dist.: General fault detection	73	ms since fault (-1 = no occurance)
Dist.: Fault detection only phase L1	74	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L1,E	75	ms since fault (-1 = no occurance)
Dist.: Fault detection only phase L2	76	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L2,E	77	ms since fault (-1 = no occurance)
Dist.: Fault detection only phase L1,2	78	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L1,2,E	79	ms since fault (-1 = no occurance)
Dist.: Fault detection only phase L3	80	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L3,E	81	ms since fault (-1 = no occurance)
Dist.: Fault detection only phase L1,3	82	ms since fault (-1 = no occurance)

Real-Time Device Data Stored in PLC (7SA511) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Dist.: Fault detection phase L1,3,E	83	ms since fault (-1 = no occurance)
Dist.: Fault detection only phase L2,3	84	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L2,3,E	85	ms since fault (-1 = no occurance)
Dist.: Fault detection only phase L1,2,3	86	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L1,2,3,E	87	ms since fault (-1 = no occurance)
Dist.: Fault det. In forward direction	88	ms since fault (-1 = no occurance)
Dist.: Fault det. In reverse direction	89	ms since fault (-1 = no occurance)
Dist.: Time T1 (Zone Z1) expired	90	ms since fault (-1 = no occurance)
Dist.: Time T2 (Zone Z2) expired	91	ms since fault (-1 = no occurance)
Dist.: Time T3 (Zone Z3) expired	92	ms since fault (-1 = no occurance)
Dist.: Time T4 (direct. zone) expired	93	ms since fault (-1 = no occurance)
Dist.: Time T5 (non-direct. zone) expired	94	ms since fault (-1 = no occurance)
Dist.: Time T1B (Zone Z1B) expired	95	ms since fault (-1 = no occurance)
Dist.: Time T1L (Zone Z1L) expired	96	ms since fault (-1 = no occurance)
Distance Protection: General Trip	97	ms since fault (-1 = no occurance)
Dist. Teleprotection: Carrier reception	98	ms since fault (-1 = no occurance)
Dist. Teleprotection: Carrier send	99	ms since fault (-1 = no occurance)
POTT Teleprotection: Transient block	100	ms since fault (-1 = no occurance)
Ext. trip via binary input: Trip	101	ms since fault (-1 = no occurance)
Ext. trip via binary input: 1pole L1	102	ms since fault (-1 = no occurance)
Ext. trip via binary input: 1pole L2	103	ms since fault (-1 = no occurance)
Ext. trip via binary input: 1pole L3	104	ms since fault (-1 = no occurance)
Ext. trip via binary input: 3pole	105	ms since fault (-1 = no occurance)
Ext. trip via binary input: Without AR	106	ms since fault (-1 = no occurance)
Reserved	107–110	For future expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.
2. Status information for each parameter is transmitted in two bits. The status bit indicates status (true = 1, false = 0) for the parameter and the valid bit indicates that the device has sucessfully updated the value in the status bit (true = 1, false = 0).

Device Command Data Retrieved From PLC (7SA511)

First Command Word (Command Word)	Additional Command Words (Data or Value)
0 = No command	Unused
1 = Time Sync	2nd Word: Time [ms] - (0-59999) 3rd Word: Time [h/m] - high byte: HH (1-24), low byte: MM (0-59) 4th Word: Date [m/d] - high byte: MM (1-12), low byte: DD (1-31) 5th Word: Date [y] - YY (00-99)

Device Command Data Retrieved From PLC (7SA511)

First Command Word (Command Word)	Additional Command Words (Data or Value)
2 = Reset LEDs	Unused
3 = Activate Parameter Set A	Unused
4 = Activate Parameter Set B	Unused
5 = Activate Parameter Set C	Unused
6 = Activate Parameter Set D	Unused
10 = General Command	2nd Word: [Typ] in high byte, [Inf] in low byte

E13 Device Type: 7SA513

Real-Time Device Data Stored in PLC (7SA513)

Function	Register Location in PLC Block [1]	Range or Contents
Current Phase A (I_{L1})	0	%
Current Phase B (I_{L2})	1	%
Current Phase C (I_{L3})	2	%
Voltage L-N Phase A ($U_{L1}E$)	3	%
Voltage L-N Phase B ($U_{L2}E$)	4	%
Voltage L-N Phase C ($U_{L2}E$)	5	%
Watts Three-phase (Pa)	6	%
VAR Three-phase (Pr)	7	%
Frequency (f)	8	%
Voltage L-L Phase AB (U_{L12})	9	%
Voltage L-L Phase BC (U_{L23})	10	%
Voltage L-L Phase CA (U_{L31})	11	%
I_{ea}	12	mA
I_{er}	13	mA
General Status Word 1[2]	14	**Bit** **Contents** 15 Setting group C is active (Valid) 14 Setting group C is active (Status) 13 Setting group B is active (Valid) 12 Setting group B is active (Status) 11 Setting group A is active (Valid) 10 Setting group A is active (Status) 9 Device operative/healthy (Valid) 8 Device operative/healthy (Status) 7 >User defined annunciation 4 (Valid) 6 >User defined annunciation 4 (Status) 5 >User defined annunciation 3 (Valid) 4 >User defined annunciation 3 (Status) 3 >User defined annunciation 2 (Valid) 2 >User defined annunciation 2 (Status) 1 >User defined annunciation 1 (Valid) 0 >User defined annunciation 1 (Status)
General Status Word 2[2]	15	**Bit** **Contents** 15 >U Line side VT MCB tripped (Valid) 14 >U Line side VT MCB tripped (Status) 13 Failure: Phase sequence supervision (Valid) 12 Failure: Phase sequence supervision (Status) 11 Fuse Failure Monitor Operated (>10s) (Valid) 10 Fuse Failure Monitor Operated (>10s) (Status) 9 Measured value supervision of voltages (Valid) 8 Measured value supervision of voltages (Status) 7 Measured value supervision of currents (Valid) 6 Measured value supervision of currents (Status) 5 Supervision Trip Circuit (Valid) 4 Supervision Trip Circuit (Status) 3 General internal failure of device (Valid) 2 General internal failure of device (Status) 1 Setting group D is active (Valid) 0 Setting group D is active (Status)

Real-Time Device Data Stored in PLC (7SA513) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
General Status Word 3[2]	16	**Bit** **Contents** 15 AR: Auto-reclose is blocked (Valid) 14 AR: Auto-reclose is blocked (Status) 13 Back-up Overcurrent prot. Is active (Valid) 12 Back-up Overcurrent prot. Is active (Status) 11 Emergency O/C protection is active (Valid) 10 Emergency O/C protection is active (Status) 9 Emergency O/C protection is blocked (Valid) 8 Emergency O/C protection is blocked (Status) 7 Breaker failure protection is active (Valid) 6 Breaker failure protection is active (Status) 5 Earth fault protection is active (Valid) 4 Earth fault protection is active (Status) 3 Earth fault (isol./comp.) reverse dir. (Valid) 2 Earth fault (isol./comp.) reverse dir. (Status) 1 Earth fault (isol./comp.) forward dir. (Valid) 0 Earth fault (isol./comp.) forward dir. (Status)
General Status Word 4[2]	17	**Bit** **Contents** 15 Dist. teleprotection: Carrier faulty (Valid) 14 Dist. teleprotection: Carrier faulty (Status) 13 Distance Protection is active (Valid) 12 Distance Protection is active (Status) 11 Distance Protection is blocked (Valid) 10 Distance Protection is blocked (Status) 9 Synchro-Check function Faulty (Valid) 8 Synchro-Check function Faulty (Status) 7 Synchro-Check function is blocked (Valid) 6 Synchro-Check function is blocked (Status) 5 AR: Circuit Breaker not Ready (Valid) 4 AR: Circuit Breaker not Ready (Status) 3 AR: Auto-reclose is dynamically blocked (Valid) 2 AR: Auto-reclose is dynamically blocked (Status) 1 AR: Auto-reclose is not ready (Valid) 0 AR: Auto-reclose is not ready (Status)
General Status Word 5[2]	18	**Bit** **Contents** 12–15 Not Used 11 Overvoltage protection active (Valid) 10 Overvoltage protection active (Status) 9 Switch-onto-fault is active (Valid) 8 Switch-onto-fault is active (Status) 7 Switch-onto-fault is blocked (Valid) 6 Switch-onto-fault is blocked (Status) 5 Weak infeed function is active (Valid) 4 Weak infeed function is active (Status) 3 Weak infeed function is blocked (Valid) 2 Weak infeed function is blocked (Status) 1 Power Swing Detection (Valid) 0 Power Swing Detection (Status)
Number of Last Fault	19	0…32767, 0=no faults
Fault Date/Time (ms)	20	0…59999 (ms)
Fault Date/Time (h/m)	21	High byte: HH (0…23), Low byte: MM (0…59)
Fault Date/Time (m/d)	22	High byte: MM (1…12); Low byte: DD (1…31)
Fault Date/Time (y)	23	Year: YY (00…99)
Interrupted current: Phase L1 (I/I_n)	24	ms since fault (-1 = no occurance)
Interrupted current: Phase L1 (I/I_n)	25	Low word
Interrupted current: Phase L1 (I/I_n)	26	High word

Real-Time Device Data Stored in PLC (7SA513) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Interrupted current: Phase L2 (I/I_n)	27	ms since fault (-1 = no occurance)
Interrupted current: Phase L2 (I/I_n)	28	Low word
Interrupted current: Phase L2 (I/I_n)	29	High word
Interrupted current: Phase L3 (I/I_n)	30	ms since fault (-1 = no occurance)
Interrupted current: Phase L3 (I/I_n)	31	Low word
Interrupted current: Phase L3 (I/I_n)	32	High word
Fault Resistance, Ohm Primary	33	ms since fault (-1 = no fault)
Fault Resistance, Ohm Primary	34	Low word
Fault Resistance, Ohm Primary	35	High word
Fault Reactance, Ohm Primary	36	ms since fault (-1 = no fault)
Fault Reactance, Ohm Primary	37	Low word
Fault Reactance, Ohm Primary	38	High word
Fault Resistance, Ohm Secendary	39	ms since fault (-1 = no fault)
Fault Resistance, Ohm Secendary	40	Low word
Fault Resistance, Ohm Secendary	41	High word
Fault Reactance, Ohm Secendary	42	ms since fault (-1 = no fault)
Fault Reactance, Ohm Secendary	43	Low word
Fault Reactance, Ohm Secendary	44	High word
Distance to fault in km	45	ms since fault (-1 = no fault)
Distance to fault in km	46	Low word
Distance to fault in km	47	High word
Distance to fault in %	48	ms since fault (-1 = no fault)
Distance to fault in %	49	Low word
Distance to fault in %	50	High word
Fault in the power system	51	ms since fault (-1 = no fault)
General Trip of Device	52	ms since fault (-1 = no occurance)
General Trip for Fault in Forward Direction	53	ms since fault (-1 = no occurance)
General Trip for Fault in Reverse Direction	54	ms since fault (-1 = no occurance)
Trip by earth fault det. (isol./comp.)	55	ms since fault (-1 = no occurance)
Trip by earth fault protection	56	ms since fault (-1 = no occurance)
Carrier Transmission for dir. Comp. E/F	57	ms since fault (-1 = no occurance)
Transient Block. Of E/F protection	58	ms since fault (-1 = no occurance)

Real-Time Device Data Stored in PLC (7SA513) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Trip by Breaker Failure Protection	59	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L1 only	60	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L1E	61	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L2 only	62	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L2E	63	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L12	64	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L12E	65	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L3 only	66	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L3E	67	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L13	68	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L13E	69	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L23	70	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L23E	71	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L123	72	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L123E	73	ms since fault (-1 = no occurance)
Emerg. O/C protection: General Trip	74	ms since fault (-1 = no occurance)
AR: Close command from auto-reclose	75	ms since fault (-1 = no occurance)
AR: Definitive Trip	76	ms since fault (-1 = no occurance)
Dist.: Fault detection only phase L1	77	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L1,E	78	ms since fault (-1 = no occurance)
Dist.: Fault detection only phase L2	79	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L2,E	80	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L1,2	81	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L1,2,E	82	ms since fault (-1 = no occurance)
Dist.: Fault detection only phase L3	83	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L3,E	84	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L1,3	85	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L1,3,E	86	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L2,3	87	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L2,3,E	88	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L1,2,3	89	ms since fault (-1 = no occurance)
Dist.: Fault detection phase L1,2,3,E	90	ms since fault (-1 = no occurance)
Dist.: Fault det. In forward direction	91	ms since fault (-1 = no occurance)
Dist.: Fault det. In reverse direction	92	ms since fault (-1 = no occurance)
Dist.: Time T1 (Zone Z1) expired	93	ms since fault (-1 = no occurance)
Dist.: Time T2 (Zone Z2) expired	94	ms since fault (-1 = no occurance)

Real-Time Device Data Stored in PLC (7SA513) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Dist.: Time T3 (Zone Z3) expired	95	ms since fault (-1 = no occurance)
Dist.: Time T4 (direct. zone) expired	96	ms since fault (-1 = no occurance)
Dist.: Time T5 (non-direct. zone) expired	97	ms since fault (-1 = no occurance)
Dist.: Time T1B (Zone Z1B) expired	98	ms since fault (-1 = no occurance)
Dist.: Time T1L (Zone Z1L) expired	99	ms since fault (-1 = no occurance)
Distance Protection: General Trip	100	ms since fault (-1 = no occurance)
Dist. Teleprotection: Carrier reception	101	ms since fault (-1 = no occurance)
Dist. Teleprotection: Carrier send	102	ms since fault (-1 = no occurance)
POTT teleprotection: Transient block	103	ms since fault (-1 = no occurance)
Weak Infeed: General Trip	104	ms since fault (-1 = no occurance)
Switch-onto-fault: Fault Detection L1	105	ms since fault (-1 = no occurance)
Switch-onto-fault: Fault Detection L2	106	ms since fault (-1 = no occurance)
Switch-onto-fault: Fault Detection L3	107	ms since fault (-1 = no occurance)
Switch-onto-fault: Trip 3pole	108	ms since fault (-1 = no occurance)
Overvoltage Trip: Stage U>	109	ms since fault (-1 = no occurance)
Overvoltage Trip: Stage U>>	110	ms since fault (-1 = no occurance)
Ext. trip via binary input: Trip	111	ms since fault (-1 = no occurance)
Ext. trip via binary input: 1pole L1	112	ms since fault (-1 = no occurance)
Ext. trip via binary input: 1pole L2	113	ms since fault (-1 = no occurance)
Ext. trip via binary input: 1pole L3	114	ms since fault (-1 = no occurance)
Ext. trip via binary input: 3pole	115	ms since fault (-1 = no occurance)
Ext. trip via binary input: Without AR	116	ms since fault (-1 = no occurance)
Reserved	117–120	For future expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.
2. Status information for each parameter is transmitted in two bits. The status bit indicates status (true=1, false=0) for the parameter and the valid bit indicates that the device has sucessfully updated the value in the status bit (true=1, false=0).

Device Command Data Retrieved From PLC (7SA513)

First Command Word (Command Word)	Additional Command Words (Data or Value)
0 = No command	Unused
1 = Time Sync	2nd Word: Time [ms] - (0-59999) 3rd Word: Time [h/m] - high byte: HH (1-24), low byte: MM (0-59) 4th Word: Date [m/d] - high byte: MM (1-12), low byte: DD (1-31) 5th Word: Date [y] - YY (00-99)
2 = Reset LEDs	Unused
3 = Activate Parameter Set A	Unused
4 = Activate Parameter Set B	Unused

Device Command Data Retrieved From PLC (7SA513)

First Command Word (Command Word)	Additional Command Words (Data or Value)
5 = Activate Parameter Set C	Unused
6 = Activate Parameter Set D	Unused
10 = General Command	2nd Word: [Typ] in high byte, [Inf] in low byte

E.14 Device Type: 7SD511

Real-Time Device Data Stored in PLC (7SD511)

Function	Register Location in PLC Block [1]	Range or Contents
Operational Measurement: IL1a	0	%
Operational Measurement: IL2a	1	%
Operational Measurement: IL3a	2	%
Operational Measurement: Iea	3	%
Time Delay of Transmission	4	ms
General Status Word 1:[2]	5	**Bit** **Contents** 15 Parameter set C is active (Valid) 14 Parameter set C is active (Status) 13 Parameter set B is active (Valid) 12 Parameter set B is active (Status) 11 Parameter set A is active (Valid) 10 Parameter set A is active (Status) 9 Device operative/healthy (Valid) 8 Device operative/healthy (Status) 7 >User defined annunciation 4 (Valid) 6 >User defined annunciation 4 (Status) 5 >User defined annunciation 3 (Valid) 4 >User defined annunciation 3 (Status) 3 >User defined annunciation 2 (Valid) 2 >User defined annunciation 2 (Status) 1 >User defined annunciation 1 (Valid) 0 >User defined annunciation 1 (Status)
General Status Word 2:[2]	6	**Bit** **Contents** 15 Transfer Trip function is active (Valid) 14 Transfer Trip function is active (Status) 13 Current comparison protection is active (Valid) 12 Current comparison protection is active (Status) 11 Emergency O/C protection is active (Valid) 10 Emergency O/C protection is active (Status) 9 Thermal overload prot.: Current warning (Valid) 8 Thermal overload prot.: Current warning (Status) 7 Thermal overload protection is active (Valid) 6 Thermal overload protection is active (Status) 5 Measured value supervision of currents (Valid) 4 Measured value supervision of currents (Status) 3 General internal failure of device (Valid) 2 General internal failure of device (Status) 1 Parameter set D is active (Valid) 0 Parameter set D is active (Status)
General Status Word 3:[2]	7	**Bit** **Contents** 6–15 Not Used 5 External Trip is Active (Valid) 4 External Trip is Active (Status) 3 Total reception failure (Valid) 2 Total reception failure (Status) 1 CCP blocked by time deviation > 1ms (Valid) 0 CCP blocked by time deviation > 1ms (Status)
Number of Last Fault	8	0…32767, 0=no faults
Fault Date/Time (ms)	9	0…59999 (ms)
Fault Date/Time (h/m)	10	High byte: HH (0…23), Low byte: MM (0…59)
Fault Date/Time (m/d)	11	High byte: MM (1…12); Low byte: DD (1…31)
Fault Date/Time (y)	12	Year: YY (00…99)
Interrupted current: Phase L1 (I/I_n)	13	ms since fault (-1 = no occurance)
Interrupted current: Phase L1 (I/I_n)	14	Low word

Real-Time Device Data Stored in PLC (7SD511) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Interrupted current: Phase L1 (I/I_n)	15	High word
Interrupted current: Phase L2 (I/I_n)	16	ms since fault (-1 = no occurance)
Interrupted current: Phase L2 (I/I_n)	17	Low word
Interrupted current: Phase L2 (I/I_n)	18	High word
Interrupted current: Phase L3 (I/I_n)	19	ms since fault (-1 = no occurance)
Interrupted current: Phase L3 (I/I_n)	20	Low word
Interrupted current: Phase L3 (I/I_n)	21	High word
Fault in the power system	22	ms since fault (-1 = no fault)
General Trip of Device	23	ms since fault (-1 = no occurance)
General 1pole trip of device: Phase L1	24	ms since fault (-1 = no occurance)
General 1pole trip of device: Phase L2	25	ms since fault (-1 = no occurance)
General 1pole trip of device: Phase L3	26	ms since fault (-1 = no occurance)
General 3pole trip of device	27	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L1 only	28	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L1E	29	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L2 only	30	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L2E	31	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L12	32	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L12E	33	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L3 only	34	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L3E	35	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L13	36	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L13E	37	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L23	38	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L23E	39	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L123	40	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L123E	41	ms since fault (-1 = no occurance)
Emerg. O/C protection: General Trip	42	ms since fault (-1 = no occurance)
Emerg. O/C protection: Trip 1pole L1	43	ms since fault (-1 = no occurance)
Emerg. O/C protection: Trip 1pole L2	44	ms since fault (-1 = no occurance)
Emerg. O/C protection: Trip 1pole L3	45	ms since fault (-1 = no occurance)

Real-Time Device Data Stored in PLC (7SD511) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Emerg. O/C protection: Trip 3pole	46	ms since fault (-1 = no occurance)
General Trip Signal of current compare prt.	47	ms since fault (-1 = no occurance)
Trip L1 (1-pole) of current comp. prot.	48	ms since fault (-1 = no occurance)
Trip L2 (1-pole) of current comp. prot.	49	ms since fault (-1 = no occurance)
Trip L3 (1-pole) of current comp. prot.	50	ms since fault (-1 = no occurance)
Trip 3-pole of current comparison prot.	51	ms since fault (-1 = no occurance)
Reserved	52–55	For future expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.
2. Status information for each parameter is transmitted in two bits. The status bit indicates status (true=1, false=0) for the parameter and the valid bit indicates that the device has sucessfully updated the value in the status bit (true=1, false=0).

Device Command Data Retrieved From PLC (7SD511)

First Command Word (Command Word)	Additional Command Words (Data or Value)
0 = No command	Unused
1 = Time Sync	2nd Word: Time [ms] - (0-59999) 3rd Word: Time [h/m] - high byte: HH (1-24), low byte: MM (0-59) 4th Word: Date [m/d] - high byte: MM (1-12), low byte: DD (1-31) 5th Word: Date [y] - YY (00-99)
2 = Reset LEDs	Unused
3 = Activate Parameter Set A	Unused
4 = Activate Parameter Set B	Unused
5 = Activate Parameter Set C	Unused
6 = Activate Parameter Set D	Unused
10 = General Command	2nd Word: [Typ] in high byte, [Inf] in low byte

E15 Device Type: 7SD512

Real-Time Device Data Stored in PLC (7SD512)

Function	Register Location in PLC Block [1]	Range or Contents
Operational Measurement: IL1a	0	%
Operational Measurement: IL2a	1	%
Operational Measurement: IL3a	2	%
Operational Measurement: Iea	3	%
Time Delay of Transmission	4	ms
General Status Word 1:[2]	5	**Bit** **Contents** 15 Parameter set C is active (Valid) 14 Parameter set C is active (Status) 13 Parameter set B is active (Valid) 12 Parameter set B is active (Status) 11 Parameter set A is active (Valid) 10 Parameter set A is active (Status) 9 Device operative/healthy (Valid) 8 Device operative/healthy (Status) 7 >User defined annunciation 4 (Valid) 6 >User defined annunciation 4 (Status) 5 >User defined annunciation 3 (Valid) 4 >User defined annunciation 3 (Status) 3 >User defined annunciation 2 (Valid) 2 >User defined annunciation 2 (Status) 1 >User defined annunciation 1 (Valid) 0 >User defined annunciation 1 (Status)
General Status Word 2:[2]	6	**Bit** **Contents** 15 AR: Auto-reclose is not ready (Valid) 14 AR: Auto-reclose is not ready (Status) 13 AR: Auto-reclose is blocked (Valid) 12 AR: Auto-reclose is blocked (Status) 11 Emergency O/C protection is active (Valid) 10 Emergency O/C protection is active (Status) 9 Thermal overload prot.: Current warning (Valid) 8 Thermal overload prot.: Current warning (Status) 7 Thermal overload protection is active (Valid) 6 Thermal overload protection is active (Status) 5 Measured value supervision of currents (Valid) 4 Measured value supervision of currents (Status) 3 General internal failure of device (Valid) 2 General internal failure of device (Status) 1 Parameter set D is active (Valid) 0 Parameter set D is active (Status)
General Status Word 3:[2]	7	**Bit** **Contents** 12–15 Not Used 11 External Trip is Active (Valid) 10 External Trip is Active (Status) 9 Total reception failure (Valid) 8 Total reception failure (Status) 7 CCP blocked by time deviation > 1ms (Valid) 6 CCP blocked by time deviation > 1ms (Status) 5 Transfer Trip function is active (Valid) 4 Transfer Trip function is active (Status) 3 Current comparison protection is active (Valid) 2 Current comparison protection is active (Status) 1 AR: Auto-reclose is dynamically blocked (Valid) 0 AR: Auto-reclose is dynamically blocked (Status)
Number of Last Fault	8	0…32767, 0 = no faults
Fault Date/Time (ms)	9	0…59999 (ms)
Fault Date/Time (h/m)	10	High byte: HH (0…23), Low byte: MM (0…59)
Fault Date/Time (m/d)	11	High byte: MM (1…12); Low byte: DD (1…31)

Real-Time Device Data Stored in PLC (7SD512) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Fault Date/Time (y)	12	Year: YY (00…99)
Interrupted current: Phase L1 (I/I_n)	13	ms since fault (-1 = no occurance)
Interrupted current: Phase L1 (I/I_n)	14	Low word
Interrupted current: Phase L1 (I/I_n)	15	High word
Interrupted current: Phase L2 (I/I_n)	16	ms since fault (-1 = no occurance)
Interrupted current: Phase L2 (I/I_n)	17	Low word
Interrupted current: Phase L2 (I/I_n)	18	High word
Interrupted current: Phase L3 (I/I_n)	19	ms since fault (-1 = no occurance)
Interrupted current: Phase L3 (I/I_n)	20	Low word
Interrupted current: Phase L3 (I/I_n)	21	High word
Fault in the power system	22	ms since fault (-1 = no fault)
General Trip of Device	23	ms since fault (-1 = no occurance)
General 1pole trip of device: Phase L1	24	ms since fault (-1 = no occurance)
General 1pole trip of device: Phase L2	25	ms since fault (-1 = no occurance)
General 1pole trip of device: Phase L3	26	ms since fault (-1 = no occurance)
General 3pole trip of device	27	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L1 only	28	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L1E	29	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L2 only	30	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L2E	31	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L12	32	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L12E	33	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L3 only	34	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L3E	35	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L13	36	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L13E	37	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L23	38	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L23E	39	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L123	40	ms since fault (-1 = no occurance)
Emerg. O/C fault detection L123E	41	ms since fault (-1 = no occurance)
Emerg. O/C protection: General Trip	42	ms since fault (-1 = no occurance)
Emerg. O/C protection: Trip 1pole L1	43	ms since fault (-1 = no occurance)

Real-Time Device Data Stored in PLC (7SD512) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Emerg. O/C protection: Trip 1pole L2	44	ms since fault (-1 = no occurance)
Emerg. O/C protection: Trip 1pole L3	45	ms since fault (-1 = no occurance)
Emerg. O/C protection: Trip 3pole	46	ms since fault (-1 = no occurance)
79-A/R CLOSE command	47	ms since fault (-1 = no occurance)
General Trip Signal of current compare prt.	48	ms since fault (-1 = no occurance)
Trip L1 (1-pole) of current comp. prot.	49	ms since fault (-1 = no occurance)
Trip L2 (1-pole) of current comp. prot.	50	ms since fault (-1 = no occurance)
Trip L3 (1-pole) of current comp. prot.	51	ms since fault (-1 = no occurance)
Trip 3-pole of current comparison prot.	52	ms since fault (-1 = no occurance)
Reserved	53–56	For future expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.
2. Status information for each parameter is transmitted in two bits. The status bit indicates status (true = 1, false = 0) for the parameter and the valid bit indicates that the device has sucessfully updated the value in the status bit (true = 1, false = 0).

Device Command Data Retrieved From PLC (7SD512)

First Command Word (Command Word)	Additional Command Words (Data or Value)
0 = No command	Unused
1 = Time Sync	2nd Word: Time [ms] - (0-59999) 3rd Word: Time [h/m] - high byte: HH (1-24), low byte: MM (0-59) 4th Word: Date [m/d] - high byte: MM (1-12), low byte: DD (1-31) 5th Word: Date [y] - YY (00-99)
2 = Reset LEDs	Unused
3 = Activate Parameter Set A	Unused
4 = Activate Parameter Set B	Unused
5 = Activate Parameter Set C	Unused
6 = Activate Parameter Set D	Unused
10 = General Command	2nd Word: [Typ] in high byte, [Inf] in low byte

E.16 Device Type: 7SJ511

Real-Time Device Data Stored in PLC (7SJ511)

Function	Register Location in PLC Block [1]	Range or Contents
Phase A current (IL1)	0	%
Phase B current (IL2)	1	%
Phase C current (IL3)	2	%
Neutral current (IE)	3	%
PhA-N voltage (UL1E)	4	%
PhB-N voltage (UL2E)	5	%
PhC-N voltage (UL3E)	6	%
PhA to PhB voltage (UE)	7	%
Three phase Watt (Pa)	8	%
Three phase Var (Pr)	9	%
Volt-amperes (S)	10	%
Power factor cos(phi)	11	%
Frequency (f)	12	%
IEEwLSA	13	mA
IEEbLSA	14	mA
General Status Word 1: [2]	15	**Bit** **Contents** 15 Setting group C is active (Valid) 14 Setting group C is active (Status) 13 Setting group B is active (Valid) 12 Setting group B is active (Status) 11 Setting group A is active (Valid) 10 Setting group A is active (Status) 9 Relay is operational and protecting (Valid) 8 Relay is operational and protecting (Status) 7 >User defined event 4 (Valid) 6 >User defined event 4 (Status) 5 >User defined event 3 (Valid) 4 >User defined event 3 (Status) 3 >User defined event 2 (Valid) 2 >User defined event 2 (Status) 1 >User defined event 1 (Valid) 0 >User defined event 1 (Status)
General Status Word 2:[2]	16	**Bit** **Contents** 15 >51-BLOCK phase inverse time (Valid) 14 >51-BLOCK phase inverse time (Status) 13 >50-BLOCK phase instantaneous (Valid) 12 >50-BLOCK phase instantaneous (Status) 11 >50HS-BLOCK phase high-set (Valid) 10 >50HS-BLOCK phase high-set (Status) 9 Thermal overload prot.: Thermal warning (Valid) 8 Thermal overload prot.: Thermal warning (Status) 7 Thermal overload prot.: Current warning (Valid) 6 Thermal overload prot.: Current warning (Status) 5 Failure: Current supervision (Valid) 4 Failure: Current supervision (Status) 3 Error with a summary alarm (Valid) 2 Error with a summary alarm (Status) 1 Setting group D is active (Valid) 0 Setting group D is active (Status)

Real-Time Device Data Stored in PLC (7SJ511) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
General Status Word 3:[2]	17	**Bit** **Contents** 14–15 Not Used 13 Non-dir. ground O/C prot. PICKUP (Valid) 12 Non-dir. ground O/C prot. PICKUP (Status) 11 Non-dir. phase C O/C prot. PICKUP (Valid) 10 Non-dir. phase C O/C prot. PICKUP (Status) 9 Non-dir. phase B O/C prot. PICKUP (Valid) 8 Non-dir. phase B O/C prot. PICKUP (Status) 7 Non-dir. phase A O/C prot. PICKUP (Valid) 6 Non-dir. phase A O/C prot. PICKUP (Status) 5 >51N-BLOCK ground inverse time (Valid) 4 >51N-BLOCK ground inverse time (Status) 3 >50N-BLOCK ground instantaneous (Valid) 2 >50N-BLOCK ground instantaneous (Status) 1 >50NHS-BLOCK ground high-set (Valid) 0 >50NHS-BLOCK ground high-set (Status)
Number of Last Fault	18	0…32767, 0 = no faults
Fault Date/Time (ms)	19	0…59999 (ms)
Fault Date/Time (h/m)	20	High byte: HH (0…23), Low byte: MM (0…59)
Fault Date/Time (m/d)	21	High byte: MM (1…12); Low byte: DD (1…31)
Fault Date/Time (y)	22	Year: YY (00…99)
Interrupted current: Phase L1 (I/I_n)	23	ms since fault (-1 = no occurance)
Interrupted current: Phase L1 (I/I_n)	24	Low word
Interrupted current: Phase L1 (I/I_n)	25	High word
Interrupted current: Phase L2 (I/I_n)	26	ms since fault (-1 = no occurance)
Interrupted current: Phase L2 (I/I_n)	27	Low word
Interrupted current: Phase L2 (I/I_n)	28	High word
Interrupted current: Phase L3 (I/I_n)	29	ms since fault (-1 = no occurance)
Interrupted current: Phase L3 (I/I_n)	30	Low word
Interrupted current: Phase L3 (I/I_n)	31	High word
Fault in the power system	32	ms since fault (-1 = no fault)
General Trip of Device	33	ms since fault (-1 = no occurance)
50BF-Breaker Fail TRIP	34	ms since fault (-1 = no occurance)
Thermal overload protection trip	35	ms since fault (-1 = no occurance)
O/C Fault Detection L1 only	36	ms since fault (-1 = no occurance)
O/C Fault Detection L1-E	37	ms since fault (-1 = no occurance)
O/C Fault Detection L2 only	38	ms since fault (-1 = no occurance)
O/C Fault Detection L2-E	39	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L2	40	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L2-E	41	ms since fault (-1 = no occurance)
O/C Fault Detection L3	42	ms since fault (-1 = no occurance)
O/C Fault Detection L3-E	43	ms since fault (-1 = no occurance)

Real-Time Device Data Stored in PLC (7SJ511) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
O/C Fault Detection L1-L3	44	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L3-E	45	ms since fault (-1 = no occurance)
O/C Fault Detection L2-L3	46	ms since fault (-1 = no occurance)
O/C Fault Detection L2-L3-E	47	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L2-L3	48	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L2-L3-E	49	ms since fault (-1 = no occurance)
O/C Fault Detection E only	50	ms since fault (-1 = no occurance)
O/C General Trip Command	51	ms since fault (-1 = no occurance)
50HS-Phase high-set element TRIP	52	ms since fault (-1 = no occurance)
50-Phase inst. element TRIP	53	ms since fault (-1 = no occurance)
51-Phase time element TRIP	54	ms since fault (-1 = no occurance)
50NHS-Ground high-set element TRIP	55	ms since fault (-1 = no occurance)
50N-Ground inst. element TRIP	56	ms since fault (-1 = no occurance)
51N-Ground time element TRIP	57	ms since fault (-1 = no occurance)
Reserved	58–61	For future expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.
2. Status information for each parameter is transmitted in two bits. The status bit indicates status (true = 1, false = 0) for the parameter and the valid bit indicates that the device has sucessfully updated the value in the status bit (true = 1, false = 0).

Device Command Data Retrieved From PLC (7SJ511)

First Command Word (Command Word)	Additional Command Words (Data or Value)
0 = No command	Unused
1 = Time Sync	2nd Word: Time [ms] - (0-59999) 3rd Word: Time [h/m] - high byte: HH (1-24), low byte: MM (0-59) 4th Word: Date [m/d] - high byte: MM (1-12), low byte: DD (1-31) 5th Word: Date [y] - YY (00-99)
2 = Reset LEDs	Unused
3 = Activate Parameter Set A	Unused
4 = Activate Parameter Set B	Unused
5 = Activate Parameter Set C	Unused
6 = Activate Parameter Set D	Unused
10 = General Command	2nd Word: [Typ] in high byte, [Inf] in low byte

E.17 Device Type: 7SJ512

Real-Time Device Data Stored in PLC (7SJ512)

Function	Register Location in PLC Block [1]	Range or Contents
Phase A current (IL1)	0	%
Phase B current (IL2)	1	%
Phase C current (IL3)	2	%
Neutral current (IE)	3	%
PhA-N voltage (UL1E)	4	%
PhB-N voltage (UL2E)	5	%
PhC-N voltage (UL3E)	6	%
PhA to PhB voltage (UE)	7	%
Three phase Watt (Pa)	8	%
Three phase Var (Pr)	9	%
Volt-amperes (S)	10	%
Power factor cos(phi)	11	%
Frequency (f)	12	%
General Status Word 1:[2]	13	**Bit** **Contents** 15 Setting group C is active (Valid) 14 Setting group C is active (Status) 13 Setting group B is active (Valid) 12 Setting group B is active (Status) 11 Setting group A is active (Valid) 10 Setting group A is active (Status) 9 Relay is operational and protecting (Valid) 8 Relay is operational and protecting (Status) 7 >User defined event 4 (Valid) 6 >User defined event 4 (Status) 5 >User defined event 3 (Valid) 4 >User defined event 3 (Status) 3 >User defined event 2 (Valid) 2 >User defined event 2 (Status) 1 >User defined event 1 (Valid) 0 >User defined event 1 (Status)
General Status Word 2:[2]	14	**Bit** **Contents** 15 50BF-Breaker failure prot. is ACTIVE (Valid) 14 50BF-Breaker failure prot. is ACTIVE (Status) 13 Circuit breaker status Error (Valid) 12 Circuit breaker status Error (Status) 11 Circuit breaker is closed (Valid) 10 Circuit breaker is closed (Status) 9 Circuit breaker is open (Valid) 8 Circuit breaker is open (Status) 7 Failure: Voltage supervision (Valid) 6 Failure: Voltage supervision (Status) 5 Failure: Current supervision (Valid) 4 Failure: Current supervision (Status) 3 Error with a summary alarm (Valid) 2 Error with a summary alarm (Status) 1 Setting group D is active (Valid) 0 Setting group D is active (Status)

Real-Time Device Data Stored in PLC (7SJ512) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents	
General Status Word 3:[2]	15	**Bit**	**Contents**
		15	Non-dir. ground O/C prot. is ACTIVE (Valid)
		14	Non-dir. ground O/C prot. is ACTIVE (Status)
		13	Non-dir. phase O/C prot. is ACTIVE (Valid)
		12	Non-dir. phase O/C prot. is ACTIVE (Status)
		11	>51N-BLOCK ground inverse time (Valid)
		10	>51N-BLOCK ground inverse time (Status)
		9	>50N-BLOCK ground instantaneous (Valid)
		8	>50N-BLOCK ground instantaneous (Status)
		7	>50NHS-BLOCK ground high-set (Valid)
		6	>50NHS-BLOCK ground high-set (Status)
		5	>51-BLOCK phase inverse time (Valid)
		4	>51-BLOCK phase inverse time (Status)
		3	>50-BLOCK phase instantaneous (Valid)
		2	>50-BLOCK phase instantaneous (Status)
		1	>50HS-BLOCK phase high-set (Valid)
		0	>50HS-BLOCK phase high-set (Status)
General Status Word 4:[2]	16	**Bit**	**Contents**
		15	>79-A/R coordination control (Valid)
		14	>79-A/R coordination control (Status)
		13	67N/67NT-Dir. ground prot. is ACTIVE (Valid)
		12	67N/67NT-Dir. ground prot. is ACTIVE (Status)
		11	67N/67NT-Dir. ground prot. switched OFF (Valid)
		10	67N/67NT-Dir. ground prot. switched OFF (Status)
		9	67/67T-Dir. phase prot. is ACTIVE (Valid)
		8	67/67T-Dir. phase prot. is ACTIVE (Status)
		7	67/67T-Dir. phase prot. switched OFF (Valid)
		6	67/67T-Dir. phase prot. switched OFF (Status)
		5	Cold-Load-Pickup settings EFFECTIVE (Valid)
		4	Cold-Load-Pickup settings EFFECTIVE (Status)
		3	Cold-Load-Pickup is ACTIVE (Valid)
		2	Cold-Load-Pickup is ACTIVE (Status)
		1	Cold-Load-Pickup switched OFF (Valid)
		0	Cold-Load-Pickup switched OFF (Status)
General Status Word 5:[2]	17	**Bit**	**Contents**
		15	46-Negative seq. switched OFF (Valid)
		14	46-Negative seq. switched OFF (Status)
		13	Zone sequence coordination in PROGRESS (Valid)
		12	Zone sequence coordination in PROGRESS (Status)
		11	Zone sequence coordination switched ON (Valid)
		10	Zone sequence coordination switched ON (Status)
		9	79 -A/R cycle successful (Valid)
		8	79 -A/R cycle successful (Status)
		7	79 -A/R in LOCKOUT (Valid)
		6	79 -A/R in LOCKOUT (Status)
		5	79 -A/R is NOT READY (Valid)
		4	79 -A/R is NOT READY (Status)
		3	>79-Ext. initiation single phase seq. (Valid)
		2	>79-Ext. initiation single phase seq. (Status)
		1	>79-READY from external device for A/R (Valid)
		0	>79-READY from external device for A/R (Status)

Real-Time Device Data Stored in PLC (7SJ512) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
General Status Word 6:[2]	18	**Bit** **Contents** 14–15 Not Used 13 59-Overvoltage protection is ACTIVE (Valid) 12 59-Overvoltage protection is ACTIVE (Status) 11 59-Overvoltage protection switched OFF (Valid) 10 59-Overvoltage protection switched OFF (Status) 9 27-Undervoltage protection is ACTIVE (Valid) 8 27-Undervoltage protection is ACTIVE (Status) 7 27-Undervoltage prot. switched OFF (Valid) 6 27-Undervoltage prot. switched OFF (Status) 5 >27-2 BLOCK UV protection second step (Valid) 4 >27-2 BLOCK UV protection second step (Status) 3 >27-1 BLOCK UV protection first step (Valid) 2 >27-1 BLOCK UV protection first step (Status) 1 46-Negative seq. is ACTIVE (Valid) 0 46-Negative seq. is ACTIVE (Status)
Number of Last Fault	19	0…32767, 0 = no faults
Fault Date/Time (ms)	20	0…59999 (ms)
Fault Date/Time (h/m)	21	High byte: HH (0…23), Low byte: MM (0…59)
Fault Date/Time (m/d)	22	High byte: MM (1…12); Low byte: DD (1…31)
Fault Date/Time (y)	23	Year: YY (00…99)
Interrupted current: Phase L1 (I/I_n)	24	ms since fault (-1 = no occurance)
Interrupted current: Phase L1 (I/I_n)	25	Low word
Interrupted current: Phase L1 (I/I_n)	26	High word
Interrupted current: Phase L2 (I/I_n)	27	ms since fault (-1 = no occurance)
Interrupted current: Phase L2 (I/I_n)	28	Low word
Interrupted current: Phase L2 (I/I_n)	29	High word
Interrupted current: Phase L3 (I/I_n)	30	ms since fault (-1 = no occurance)
Interrupted current: Phase L3 (I/I_n)	31	Low word
Interrupted current: Phase L3 (I/I_n)	32	High word
Flt Loc.: Secondary react. to fault	33	ms since fault (-1 = no fault)
Flt Loc.: Secondary react. to fault	34	Low word
Flt Loc.: Secondary react. to fault	35	High word
Fault in the power system	36	ms since fault (-1 = no fault)
General Trip of Device	37	ms since fault (-1 = no occurance)
50BF-Breaker Fail TRIP	38	ms since fault (-1 = no occurance)
O/C fault detection phase 1	39	ms since fault (-1 = no occurance)
O/C fault detection phase 2	40	ms since fault (-1 = no occurance)
O/C fault detection phase 3	41	ms since fault (-1 = no occurance)
O/C fault detection earth	42	ms since fault (-1 = no occurance)
50HS-Phase high-set element TRIP	43	ms since fault (-1 = no occurance)
50-Phase inst. element TRIP	44	ms since fault (-1 = no occurance)

Real-Time Device Data Stored in PLC (7SJ512) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
51-Phase time element TRIP	45	ms since fault (-1 = no occurance)
50NHS-Ground high-set element TRIP	46	ms since fault (-1 = no occurance)
50N-Ground inst. element TRIP	47	ms since fault (-1 = no occurance)
51N-Ground time element TRIP	48	ms since fault (-1 = no occurance)
67-Dir. phase inst. element TRIP	49	ms since fault (-1 = no occurance)
67T-Dir. phase time element TRIP	50	ms since fault (-1 = no occurance)
67N-Dir. ground inst. element TRIP	51	ms since fault (-1 = no occurance)
67NT-Dir. ground time element TRIP	52	ms since fault (-1 = no occurance)
Dir. O/C protection PICKUP	53	ms since fault (-1 = no occurance)
Dir. O/C protection TRIP	54	ms since fault (-1 = no occurance)
79 -A/R cycle successful	55	ms since fault (-1 = no occurance)
46-Negative seq. protection TRIP	56	ms since fault (-1 = no occurance)
27-1 Undervoltage first step TRIP	57	ms since fault (-1 = no occurance)
27-2 Undervoltage second step TRIP	59	ms since fault (-1 = no occurance)
59-Overvoltage TRIP	59	ms since fault (-1 = no occurance)
Reserved	60–63	For future expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.
2. Status information for each parameter is transmitted in two bits. The status bit indicates status (true = 1, false = 0) for the parameter and the valid bit indicates that the device has sucessfully updated the value in the status bit (true = 1, false = 0).

Device Command Data Retrieved From PLC (7SJ512)

First Command Word (Command Word)	Additional Command Words (Data or Value)
0 = No command	Unused
1 = Time Sync	2nd Word: Time [ms] - (0-59999) 3rd Word: Time [h/m] - high byte: HH (1-24), low byte: MM (0-59) 4th Word: Date [m/d] - high byte: MM (1-12), low byte: DD (1-31) 5th Word: Date [y] - YY (00-99)
2 = Reset LEDs	Unused
3 = Activate Parameter Set A	Unused
4 = Activate Parameter Set B	Unused
5 = Activate Parameter Set C	Unused
6 = Activate Parameter Set D	Unused
10 = General Command	2nd Word: [Typ] in high byte, [Inf] in low byte

E.18 Device Type: 7SJ531

Real-Time Device Data Stored in PLC (7SJ531)

Function	Register Location in PLC Block [1]	Range or Contents
Phase A current (IL1)	0	%
Phase B current (IL2)	1	%
Phase C current (IL3)	2	%
Neutral current (IE)	3	%
PhA-N voltage (UL1E)	4	%
PhB-N voltage (UL2E)	5	%
PhC-N voltage (UL3E)	6	%
PhA-PhB voltage (UL12)	7	%
PhB-PhC voltage (UL23)	8	%
PhC-PhA voltage (UL31)	9	%
Active Power (Pa)	10	%
Reactive Power (Pr)	11	%
Frequency (f)	12	%
IEEwLSA	13	%
IEEbLSA	14	%
Power Factor (cos phi)	15	%
General Status Word 1:[2]	16	**Bit** **Contents** 15 Error with a summary alarm (Valid) 14 Error with a summary alarm (Status) 13 Setting group B is active (Valid) 12 Setting group B is active (Status) 11 Setting group A is active (Valid) 10 Setting group A is active (Status) 9 Relay is operational and protecting (Valid) 8 Relay is operational and protecting (Status) 7 >User defined event 4 (Valid) 6 >User defined event 4 (Status) 5 >User defined event 3 (Valid) 4 >User defined event 3 (Status) 3 >User defined event 2 (Valid) 2 >User defined event 2 (Status) 1 >User defined event 1 (Valid) 0 >User defined event 1 (Status)
General Status Word 2:[2]	17	**Bit** **Contents** 15 IE setting exceeded (Valid) 14 IE setting exceeded (Status) 13 IL3 setting exceeded (Valid) 12 IL3 setting exceeded (Status) 11 IL2 setting exceeded (Valid) 10 IL2 setting exceeded (Status) 9 IL1 setting exceeded (Valid) 8 IL1 setting exceeded (Status) 7 Failure: Battery (Valid) 6 Failure: Battery (Status) 5 Failure: Voltage supervision (Valid) 4 Failure: Voltage supervision (Status) 3 Failure: Current supervision (Valid) 2 Failure: Current supervision (Status) 1 Supervision Trip Circuit (Valid) 0 Supervision Trip Circuit (Status)

Real-Time Device Data Stored in PLC (7SJ531) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents	
General Status Word 3:[2]	18	**Bit**	**Contents**
		15	Non-dir. phase O/C prot. is ACTIVE (Valid)
		14	Non-dir. phase O/C prot. is ACTIVE (Status)
		13	Thermal overload prot.: Current warning (Valid)
		12	Thermal overload prot.: Current warning (Status)
		11	Thermal Overload Protection is ACTIVE (Valid)
		10	Thermal Overload Protection is ACTIVE (Status)
		9	50BF-Breaker failure prot. is ACTIVE (Valid)
		8	50BF-Breaker failure prot. is ACTIVE (Status)
		7	Active Power Exceeded (Valid)
		6	Active Power Exceeded (Status)
		5	Reactive Power Exceeded (Valid)
		4	Reactive Power Exceeded (Status)
		3	Power Factor Alarm (Valid)
		2	Power Factor Alarm (Status)
		1	IL< alarm (Valid)
		0	IL< alarm (Status)
General Status Word 4:[2]	19	**Bit**	**Contents**
		15	Error DC pos Q0 (Valid)
		14	Error DC pos Q0 (Status)
		13	Error CB/DC pos (Valid)
		12	Error CB/DC pos (Status)
		11	79 -A/R in LOCKOUT (Valid)
		10	79 -A/R in LOCKOUT (Status)
		9	79 -A/R is NOT READY (Valid)
		8	79 -A/R is NOT READY (Status)
		7	79-A/R is BLOCKED (Valid)
		6	79-A/R is BLOCKED (Status)
		5	67N/67NT-Dir. ground prot. is ACTIVE (Valid)
		4	67N/67NT-Dir. ground prot. is ACTIVE (Status)
		3	67/67T-Dir. phase prot. is ACTIVE (Valid)
		2	67/67T-Dir. phase prot. is ACTIVE (Status)
		1	Non-dir. ground O/C prot. is ACTIVE (Valid)
		0	Non-dir. ground O/C prot. is ACTIVE (Status)
General Status Word 5:[2]	20	**Bit**	**Contents**
		15	Error DC pos Q16 (Valid)
		14	Error DC pos Q16 (Status)
		13	Error DC pos Q15 (Valid)
		12	Error DC pos Q15 (Status)
		11	Error DC pos Q10 (Valid)
		10	Error DC pos Q10 (Status)
		9	Error DC pos Q8 (Valid)
		8	Error DC pos Q8 (Status)
		7	Error DC pos Q6 (Valid)
		6	Error DC pos Q6 (Status)
		5	Error DC pos Q5 (Valid)
		4	Error DC pos Q5 (Status)
		3	Error DC pos Q01 (Valid)
		2	Error DC pos Q01 (Status)
		1	Error DC pos Q1 (Valid)
		0	Error DC pos Q1 (Status)

Real-Time Device Data Stored in PLC (7SJ531) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
General Status Word 6:[2]	21	**Bit** **Contents** 15 DC-Q10 pos (Valid) 14 DC-Q10 pos (Status) 13 DC-Q8 pos (Valid) 12 DC-Q8 pos (Status) 11 DC-Q6 pos (Valid) 10 DC-Q6 pos (Status) 9 DC-Q5 pos (Valid) 8 DC-Q5 pos (Status) 7 DC-Q01 pos (Valid) 6 DC-Q01 pos (Status) 5 DC-Q1 pos (Valid) 4 DC-Q1 pos (Status) 3 CB-Q0 pos (Valid) 2 CB-Q0 pos (Status) 1 Error DC pos Q2 (Valid) 0 Error DC pos Q2 (Status)
General Status Word 7:[2]	22	**Bit** **Contents** 15 Starting Time Supervision Active (Valid) 14 Starting Time Supervision Active (Status) 13 59-Overvoltage protection is ACTIVE (Valid) 12 59-Overvoltage protection is ACTIVE (Status) 11 27-Undervoltage protection is ACTIVE (Valid) 10 27-Undervoltage protection is ACTIVE (Status) 9 46-Negative seq. is ACTIVE (Valid) 8 46-Negative seq. is ACTIVE (Status) 7 Motor start protection is ACTIVE (Valid) 6 Motor start protection is ACTIVE (Status) 5 DC-Q2 pos (Valid) 4 DC-Q2 pos (Status) 3 DC-Q16 pos (Valid) 2 DC-Q16 pos (Status) 1 DC-Q15 pos (Valid) 0 DC-Q15 pos (Status)
General Status Word 8:[2]	23	**Bit** **Contents** 2–15 Not Used 1 Trip Circuit Interrupted (Valid) 0 Trip Circuit Interrupted (Status)
Number of Last Fault	24	0…32767, 0 = no faults
Fault Date/Time (ms)	25	0…59999 (ms)
Fault Date/Time (h/m)	26	High byte: HH (0…23), Low byte: MM (0…59)
Fault Date/Time (m/d)	27	High byte: MM (1…12); Low byte: DD (1…31)
Fault Date/Time (y)	28	Year: YY (00…99)
Interrupted current: Phase L1 (I/I_n)	29	ms since fault (-1 = no occurance)
Interrupted current: Phase L1 (I/I_n)	30	Low word
Interrupted current: Phase L1 (I/I_n)	31	High word
Interrupted current: Phase L2 (I/I_n)	32	ms since fault (-1 = no occurance)
Interrupted current: Phase L2 (I/I_n)	33	Low word
Interrupted current: Phase L2 (I/I_n)	34	High word
Interrupted current: Phase L3 (I/I_n)	35	ms since fault (-1 = no occurance)

Real-Time Device Data Stored in PLC (7SJ531) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Interrupted current: Phase L3 (I/I_n)	36	Low word
Interrupted current: Phase L3 (I/I_n)	37	High word
Fault Reactance, Ohm sec.	38	ms since fault (-1 = no occurance)
Fault Reactance, Ohm sec.	39	Low word
Fault Reactance, Ohm sec.	40	High word
Distance to fault in km	41	ms since fault (-1 = no occurance)
Distance to fault in km	42	Low word
Distance to fault in km	43	High word
Distance to fault in miles	44	ms since fault (-1 = no occurance)
Distance to fault in miles	45	Low word
Distance to fault in miles	46	High word
Magnitude of earth current	47	ms since fault (-1 = no occurance)
Magnitude of earth current	48	Low word
Magnitude of earth current	49	High word
Active component of earth current	50	ms since fault (-1 = no occurance)
Active component of earth current	51	Low word
Active component of earth current	52	High word
Reactive component of earth current	53	ms since fault (-1 = no occurance)
Reactive component of earth current	54	Low word
Reactive component of earth current	55	High word
Fault in the power system	56	ms since fault (-1 = no fault)
General Close of Device	57	ms since fault (-1 = no fault)
General Trip of Device	59	ms since fault (-1 = no fault)
General Trip of Protection	59	ms since fault (-1 = no fault)
Trip by displacement voltage stage	60	ms since fault (-1 = no fault)
Trip by sensitive IEE>> stage	61	ms since fault (-1 = no fault)
Trip by sensitive IEE> stage	62	ms since fault (-1 = no fault)
Trip by sensitive IEEp stage	63	ms since fault (-1 = no fault)
Trip by Breaker Failure Protection	64	ms since fault (-1 = no fault)
Thermal overload protection trip	65	ms since fault (-1 = no fault)
O/C fault detection phase 1	66	ms since fault (-1 = no fault)
O/C fault detection phase 2	67	ms since fault (-1 = no fault)
O/C fault detection phase 3	68	ms since fault (-1 = no fault)
O/C fault detection earth	69	ms since fault (-1 = no fault)
O/C Fault Detection L1 only	70	ms since fault (-1 = no fault)
O/C Fault Detection L1-E	71	ms since fault (-1 = no fault)
O/C Fault Detection L2 only	72	ms since fault (-1 = no fault)

Real-Time Device Data Stored in PLC (7SJ531) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
O/C Fault Detection L2-E	73	ms since fault (-1 = no fault)
O/C Fault Detection L1-L2	74	ms since fault (-1 = no fault)
O/C Fault Detection L1-L2-E	75	ms since fault (-1 = no fault)
O/C Fault Detection L3	76	ms since fault (-1 = no fault)
O/C Fault Detection L3-E	77	ms since fault (-1 = no fault)
O/C Fault Detection L1-L3	78	ms since fault (-1 = no fault)
O/C Fault Detection L1-L3-E	79	ms since fault (-1 = no fault)
O/C Fault Detection L2-L3	80	ms since fault (-1 = no fault)
O/C Fault Detection L2-L3-E	81	ms since fault (-1 = no fault)
O/C Fault Detection L1-L2-L3	82	ms since fault (-1 = no fault)
O/C Fault Detection L1-L2-L3-E	83	ms since fault (-1 = no fault)
O/C Fault Detection E only	84	ms since fault (-1 = no fault)
O/C General Trip Command	85	ms since fault (-1 = no fault)
50HS-Phase high-set element TRIP	86	ms since fault (-1 = no fault)
50-Phase inst. element TRIP	87	ms since fault (-1 = no fault)
51-Phase time element TRIP	88	ms since fault (-1 = no fault)
50NHS-Ground high-set element TRIP	89	ms since fault (-1 = no fault)
50N-Ground inst. element TRIP	90	ms since fault (-1 = no fault)
51N-Ground time element TRIP	91	ms since fault (-1 = no fault)
67HS-Dir. Phase High-Set TRIP	92	ms since fault (-1 = no fault)
67-Dir. phase inst. element TRIP	93	ms since fault (-1 = no fault)
67T-Dir. phase time element TRIP	94	ms since fault (-1 = no fault)
67HS-Dir. Ground High-Set TRIP	95	ms since fault (-1 = no fault)
67NT-Dir. ground time element TRIP	96	ms since fault (-1 = no fault)
Dir. O/C fault detection phase L1	97	ms since fault (-1 = no fault)
Dir. O/C fault detection phase L2	98	ms since fault (-1 = no fault)
Dir. O/C fault detection phase L3	99	ms since fault (-1 = no fault)
Dir. O/C fault detection earth	100	ms since fault (-1 = no fault)
Dir. O/C protection TRIP	101	ms since fault (-1 = no fault)
46-Negative seq. protection TRIP	102	ms since fault (-1 = no fault)
27-1 Undervoltage first step TRIP	103	ms since fault (-1 = no fault)
27-2 Undervoltage second step TRIP	104	ms since fault (-1 = no fault)
59-Overvoltage TRIP	105	ms since fault (-1 = no fault)
Trip by supervision of starting time	106	ms since fault (-1 = no fault)
Rotor Locked	107	ms since fault (-1 = no fault)
Reserved	108–111	For future expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.
2. Status information for each parameter is transmitted in two bits. The status bit indicates status (true = 1, false = 0) for the parameter and the valid bit indicates that the device has sucessfully updated the value in the status bit (true = 1, false = 0).

Device Command Data Retrieved From PLC (7SJ531)

First Command Word (Command Word)	Additional Command Words (Data or Value)
0 = No command	Unused
1 = Time Sync	2nd Word: Time [ms] - (0-59999) 3rd Word: Time [h/m] - high byte: HH (1-24), low byte: MM (0-59) 4th Word: Date [m/d] - high byte: MM (1-12), low byte: DD (1-31) 5th Word: Date [y] - YY (00-99)
2 = Reset LEDs	Unused
3 = Activate Parameter Set A	Unused
4 = Activate Parameter Set B	Unused
5 = Activate Parameter Set C	Unused
6 = Activate Parameter Set D	Unused
10 = General Command	2nd Word: [Typ] in high byte, [Inf] in low byte

E.19 Device Type: 7SJ600

Real-Time Device Data Stored in PLC (7SJ600)

Function	Register Location in PLC Block [1]	Range or Contents
Phase A current (IL1)	0	%
Phase B current (IL2)	1	%
Phase C current (IL3)	2	%
Operating Temperature (Theta)	3	%
Binary Inputs 1-3	4	Refer to **Section 5.8**
Signal Relays and Trip Relays	5	Refer to **Section 5.8**
LED Indicators 1-4	6	Refer to **Section 5.8**
General Status Word 1:[2]	7	**Bit** **Contents** 15 >Overcurrent protection: blockstage IE>> (Valid) 14 >Overcurrent protection: blockstage IE>> (Status) 13 >Overcurrent protection: blockstage Ip (Valid) 12 >Overcurrent protection: blockstage Ip (Status) 11 >Overcurrent protection: blockstage I> (Valid) 10 >Overcurrent protection: blockstage I> (Status) 9 >Overcurrent protection: blockstage I>> (Valid) 8 >Overcurrent protection: blockstage I>> (Status) 7 Thermal overload prot.: Thermal warning (Valid) 6 Thermal overload prot.: Thermal warning (Status) 5 Thermal overload protection is active (Valid) 4 Thermal overload protection is active (Status) 3 >Circuit breaker closed (Valid) 2 >Circuit breaker closed (Status) 1 Any protection operative (Valid) 0 Any protection operative (Status)
General Status Word 2:[2]	8	**Bit** **Contents** 15 AR: Auto-reclose in progress (Valid) 14 AR: Auto-reclose in progress (Status) 13 AR: Auto reclosure is active (Valid) 12 AR: Auto reclosure is active (Status) 11 O/C fault detection earth (Valid) 10 O/C fault detection earth (Status) 9 O/C fault detection phase L3 (Valid) 8 O/C fault detection phase L3 (Status) 7 O/C fault detection phase L2 (Valid) 6 O/C fault detection phase L2 (Status) 5 O/C fault detection phase L1 (Valid) 4 O/C fault detection phase L1 (Status) 3 >Overcurrent protection: blockstage IEp (Valid) 2 >Overcurrent protection: blockstage IEp (Status) 1 >Overcurrent protection: blockstage IE> (Valid) 0 >Overcurrent protection: blockstage IE> (Status)
General Status Word 3:[2]	9	**Bit** **Contents** 15 >Trip circuit supervision: CB aux. (Valid) 14 >Trip circuit supervision: CB aux. (Status) 13 >Trip circuit supervision: Trip relay (Valid) 12 >Trip circuit supervision: Trip relay (Status) 11 Supervision of starting time active (Valid) 10 Supervision of starting time active (Status) 9 >Starting time supervision: Block stage (Valid) 8 >Starting time supervision: Block stage (Status) 7 >inst. high set prot.: Block stage I>>> (Valid) 6 >inst. high set prot.: Block stage I>>> (Status) 5 Unbalanced load protection is active (Valid) 4 Unbalanced load protection is active (Status) 3 >Reversed phase rotation (Valid) 2 >Reversed phase rotation (Status) 1 AR: Reclosure blocked (Valid) 0 AR: Reclosure blocked (Status)

Real-Time Device Data Stored in PLC (7SJ600) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
General Status Word 4:[2]	10	**Bit** **Contents** 2–15 Not Used 1 Trip circuit supervision active (Valid) 0 Trip circuit supervision active (Status)
Number of Last Fault	11	0…32767, 0 = no faults
Fault Date/Time (ms)	12	0…59999 (ms)
Fault Date/Time (h/m)	13	High byte: HH (0…23), Low byte: MM (0…59)
Fault Date/Time (m/d)	14	High byte: MM (1…12); Low byte: DD (1…31)
Fault Date/Time (y)	15	Year: YY (00…99)
Interrupted current: Phase L1 (I/I_n)	16	ms since fault (-1 = no occurance)
Interrupted current: Phase L1 (I/I_n)	17	Low word
Interrupted current: Phase L1 (I/I_n)	18	High word
Interrupted current: Phase L2 (I/I_n)	19	ms since fault (-1 = no occurance)
Interrupted current: Phase L2 (I/I_n)	20	Low word
Interrupted current: Phase L2 (I/I_n)	21	High word
Interrupted current: Phase L3 (I/I_n)	22	ms since fault (-1 = no occurance)
Interrupted current: Phase L3 (I/I_n)	23	Low word
Interrupted current: Phase L3 (I/I_n)	24	High word
Fault in the power system	25	ms since fault (-1 = no fault)
General Trip of Device	26	ms since fault (-1 = no occurance)
Thermal overload prot.: Thermal warning	27	ms since fault (-1 = no occurance)
Thermal overload protection trip	28	ms since fault (-1 = no occurance)
O/C Fault Detection L1 only	29	ms since fault (-1 = no occurance)
O/C Fault Detection L1-E	30	ms since fault (-1 = no occurance)
O/C Fault Detection L2 only	31	ms since fault (-1 = no occurance)
O/C Fault Detection L2-E	32	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L2	33	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L2-E	34	ms since fault (-1 = no occurance)
O/C Fault Detection L3	35	ms since fault (-1 = no occurance)
O/C Fault Detection L3-E	36	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L3	37	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L3-E	38	ms since fault (-1 = no occurance)
O/C Fault Detection L2-L3	39	ms since fault (-1 = no occurance)
O/C Fault Detection L2-L3-E	40	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L2-L3	41	ms since fault (-1 = no occurance)
O/C Fault Detection L1-L2-L3-E	42	ms since fault (-1 = no occurance)
O/C Fault Detection E only	43	ms since fault (-1 = no occurance)

Real-Time Device Data Stored in PLC (7SJ600) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
O/C protection I>> phase Trip	44	ms since fault (-1 = no occurance)
O/C protection I> phase Trip	45	ms since fault (-1 = no occurance)
O/C protection Ip phase Trip	46	ms since fault (-1 = no occurance)
O/C protection IE>> earth Trip	47	ms since fault (-1 = no occurance)
O/C protection IE> earth Trip	48	ms since fault (-1 = no occurance)
O/C protection IEp earth Trip	49	ms since fault (-1 = no occurance)
AR: Close command from auto-reclose	50	ms since fault (-1 = no occurance)
AR: Definitive trip	51	ms since fault (-1 = no occurance)
Neg. seq. I. (I2) prot.: Trip	52	ms since fault (-1 = no occurance)
O/C protection I>>> phase trip	53	ms since fault (-1 = no occurance)
Supervision of starting time trip	54	ms since fault (-1 = no occurance)
CT Primary	55	0-50000
CT Secondary	56	1 or 5
Reserved	57-60	For Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.
2. Status information for each parameter is transmitted in two bits. The status bit indicates status (true = 1, false = 0) for the parameter and the valid bit indicates that the device has sucessfully updated the value in the status bit (true = 1, false = 0).

Device Command Data Retrieved From PLC (7SJ600)

First Command Word (Command Word)	Additional Command Words (Data or Value)
0 = No command	Unused
1 = Time Sync	2nd Word: Time [ms] - (0-59999) 3rd Word: Time [h/m] - high byte: HH (1-24), low byte: MM (0-59) 4th Word: Date [m/d] - high byte: MM (1-12), low byte: DD (1-31) 5th Word: Date [y] - YY (00-99)
2 = Reset LEDs	Unused

E.20 Device Type: 7UT512

Real-Time Device Data Stored in PLC (7UT512)

Function	Register Location in PLC Block [1]	Range or Contents
Operat. meas. current L1 side 1 (I1_L1)	0	%
Operat. meas. current L2 side 1 (I1_L2)	1	%
Operat. meas. current L1 side 3 (I1_L3)	2	%
Operat. meas. current L1 side 2 (I2_L1)	3	%
Operat. meas. current L2 side 2 (I2_L2)	4	%
Operat. meas. current L3 side 2 (I2_L3)	5	%
Operat. meas. current L1 side 3 (I3_L1)	6	%
Operat. meas. current L2 side 3 (I3_L2)	7	%
Operat. meas. current L3 side 3 (I3_L3)	8	%
Operat. meas. current IA	9	%
Operat. meas. current IB	10	%
General Status Word 1:[2]	11	**Bit** **Contents** 15 Parameter set C is active (Valid) 14 Parameter set C is active (Status) 13 Parameter set B is active (Valid) 12 Parameter set B is active (Status) 11 Parameter set A is active (Valid) 10 Parameter set A is active (Status) 9 Device operative/healthy (Valid) 8 Device operative/healthy (Status) 7 >User defined annunciation 4 (Valid) 6 >User defined annunciation 4 (Status) 5 >User defined annunciation 3 (Valid) 4 >User defined annunciation 3 (Status) 3 >User defined annunciation 2 (Valid) 2 >User defined annunciation 2 (Status) 1 >User defined annunciation 1 (Valid) 0 >User defined annunciation 1 (Status)
General Status Word 2:[2]	12	**Bit** **Contents** 15 Thermal overload prot.2: Current Warn. (Valid) 14 Thermal overload prot.2: Current Warn. (Status) 13 Thermal overload protection 2 active (Valid) 12 Thermal overload protection 2 active (Status) 11 Thermal overload prot.1: Current Warn. (Valid) 10 Thermal overload prot.1: Current Warn. (Status) 9 Thermal overload protection 1 active (Valid) 8 Thermal overload protection 1 active (Status) 7 >Trip stage from Buchholz protection (Valid) 6 >Trip stage from Buchholz protection (Status) 5 Measured value supervision of currents (Valid) 4 Measured value supervision of currents (Status) 3 General internal failure of device (Valid) 2 General internal failure of device (Status) 1 Parameter set D is active (Valid) 0 Parameter set D is active (Status)

Real-Time Device Data Stored in PLC (7UT512) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
General Status Word 3:[2]	13	**Bit** **Contents** 8–15 Not Used 7 Differential protection is active (Valid) 6 Differential protection is active (Status) 5 External trip 2 is active (Valid) 4 External trip 2 is active (Status) 3 External trip 1 is active (Valid) 2 External trip 1 is active (Status) 1 Back-up overcurrent prot. is active (Valid) 0 Back-up overcurrent prot. is active (Status)
Number of Last Fault	14	0…32767, 0 = no faults
Fault Date/Time (ms)	15	0…59999 (ms)
Fault Date/Time (h/m)	16	High byte: HH (0…23), Low byte: MM (0…59)
Fault Date/Time (m/d)	17	High byte: MM (1…12); Low byte: DD (1…31)
Fault Date/Time (y)	18	Year: YY (00…99)
Diff. Curr. Of L1 at Trip (fundamental)	19	ms since fault (-1 = no occurance)
Diff. Curr. Of L1 at Trip (fundamental)	20	Low word
Diff. Curr. Of L1 at Trip (fundamental)	21	High word
Diff. Curr. Of L2 at Trip (fundamental)	22	ms since fault (-1 = no occurance)
Diff. Curr. Of L2 at Trip (fundamental)	23	Low word
Diff. Curr. Of L2 at Trip (fundamental)	24	High word
Diff. Curr. Of L3 at Trip (fundamental)	25	ms since fault (-1 = no occurance)
Diff. Curr. Of L3 at Trip (fundamental)	26	Low word
Diff. Curr. Of L3 at Trip (fundamental)	27	High word
Restr. Curr. Of L1 at Trip (average DC)	28	ms since fault (-1 = no occurance)
Restr. Curr. Of L1 at Trip (average DC)	29	Low word
Restr. Curr. Of L1 at Trip (average DC)	30	High word
Restr. Curr. Of L2 at Trip (average DC)	31	ms since fault (-1 = no occurance)
Restr. Curr. Of L2 at Trip (average DC)	32	Low word
Restr. Curr. Of L2 at Trip (average DC)	33	High word
Restr. Curr. Of L3 at Trip (average DC)	34	ms since fault (-1 = no occurance)
Restr. Curr. Of L3 at Trip (average DC)	35	Low word
Restr. Curr. Of L3 at Trip (average DC)	36	High word
Fault in the power system	37	ms since fault (-1 = no fault)

Real-Time Device Data Stored in PLC (7UT512) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
General Trip of Device	38	ms since fault (-1 = no occurance)
Trip by thermal overload protection 1	39	ms since fault (-1 = no occurance)
Trip by thermal overload protection 2	40	ms since fault (-1 = no occurance)
Back-up Overcurrent: General Trip	41	ms since fault (-1 = no occurance)
External Trip 1: General Trip	42	ms since fault (-1 = no occurance)
External Trip 2: General Trip	43	ms since fault (-1 = no occurance)
Diff. Prot.: Blocked by harmonics L1	44	ms since fault (-1 = no occurance)
Diff. Prot.: Blocked by harmonics L2	45	ms since fault (-1 = no occurance)
Diff. Prot.: Blocked by harmonics L3	46	ms since fault (-1 = no occurance)
Differential Protection: General Trip	47	ms since fault (-1 = no occurance)
Differential Protection: L1	48	ms since fault (-1 = no occurance)
Differential Protection: L2	49	ms since fault (-1 = no occurance)
Differential Protection: L3	50	ms since fault (-1 = no occurance)
Differential Protection: Trip by Idiff>	51	ms since fault (-1 = no occurance)
Differential Protection: Trip by Idiff>>	52	ms since fault (-1 = no occurance)
Reserved	53–56	For Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.
2. Status information for each parameter is transmitted in two bits. The status bit indicates status (true = 1, false = 0) for the parameter and the valid bit indicates that the device has sucessfully updated the value in the status bit (true = 1, false = 0).

Device Command Data Retrieved From PLC (7UT512)

First Command Word (Command Word)	Additional Command Words (Data or Value)
0 = No command	Unused
1 = Time Sync	2nd Word: Time [ms] - (0-59999) 3rd Word: Time [h/m] - high byte: HH (1-24), low byte: MM (0-59) 4th Word: Date [m/d] - high byte: MM (1-12), low byte: DD (1-31) 5th Word: Date [y] - YY (00-99)
2 = Reset LEDs	Unused
3 = Activate Parameter Set A	Unused
4 = Activate Parameter Set B	Unused
5 = Activate Parameter Set C	Unused
6 = Activate Parameter Set D	Unused
10 = General Command	2nd Word: [Typ] in high byte, [Inf] in low byte

E.21 Device Type: 7UT513

Real-Time Device Data Stored in PLC (7UT513)

Function	Register Location in PLC Block [1]	Range or Contents
Operat. meas. current L1 side 1 (I1_L1)	0	%
Operat. meas. current L2 side 1 (I1_L2)	1	%
Operat. meas. current L1 side 3 (I1_L3)	2	%
Operat. meas. current L1 side 2 (I2_L1)	3	%
Operat. meas. current L2 side 2 (I2_L2)	4	%
Operat. meas. current L3 side 2 (I2_L3)	5	%
Operat. meas. current L1 side 3 (I3_L1)	6	%
Operat. meas. current L2 side 3 (I3_L2)	7	%
Operat. meas. current L3 side 3 (I3_L3)	8	%
Operat. meas. current IA	9	%
Operat. meas. current IB	10	%
General Status Word 1:[2]	11	**Bit** **Contents** 15 Parameter set C is active (Valid) 14 Parameter set C is active (Status) 13 Parameter set B is active (Valid) 12 Parameter set B is active (Status) 11 Parameter set A is active (Valid) 10 Parameter set A is active (Status) 9 Device operative/healthy (Valid) 8 Device operative/healthy (Status) 7 >User defined annunciation 4 (Valid) 6 >User defined annunciation 4 (Status) 5 >User defined annunciation 3 (Valid) 4 >User defined annunciation 3 (Status) 3 >User defined annunciation 2 (Valid) 2 >User defined annunciation 2 (Status) 1 >User defined annunciation 1 (Valid) 0 >User defined annunciation 1 (Status)
General Status Word 2:[2]	12	**Bit** **Contents** 15 Thermal overload prot.2: Current Warn. (Valid) 14 Thermal overload prot.2: Current Warn. (Status) 13 Thermal overload protection 2 active (Valid) 12 Thermal overload protection 2 active (Status) 11 Thermal overload prot.1: Current Warn. (Valid) 10 Thermal overload prot.1: Current Warn. (Status) 9 Thermal overload protection 1 active (Valid) 8 Thermal overload protection 1 active (Status) 7 >Trip stage from Buchholz protection (Valid) 6 >Trip stage from Buchholz protection (Status) 5 Measured value supervision of currents (Valid) 4 Measured value supervision of currents (Status) 3 General internal failure of device (Valid) 2 General internal failure of device (Status) 1 Parameter set D is active (Valid) 0 Parameter set D is active (Status)

Real-Time Device Data Stored in PLC (7UT513) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
General Status Word 3:[2]	13	**Bit** **Contents** 12–15 Not Used 11 Transformer tank protection is active (Valid) 10 Transformer tank protection is active (Status) 9 Restricted earth fault is active (Valid) 8 Restricted earth fault is active (Status) 7 Differential protection is active (Valid) 6 Differential protection is active (Status) 5 External trip 2 is active (Valid) 4 External trip 2 is active (Status) 3 External trip 1 is active (Valid) 2 External trip 1 is active (Status) 1 Back-up overcurrent prot. is active (Valid) 0 Back-up overcurrent prot. is active (Status)
Number of Last Fault	14	0…32767, 0 = no faults
Fault Date/Time (ms)	15	0…59999 (ms)
Fault Date/Time (h/m)	16	High byte: HH (0…23), Low byte: MM (0…59)
Fault Date/Time (m/d)	17	High byte: MM (1…12); Low byte: DD (1…31)
Fault Date/Time (y)	18	Year: YY (00…99)
Diff. Curr. Of L1 at Trip (fundamental)	19	ms since fault (-1 = no occurance)
Diff. Curr. Of L1 at Trip (fundamental)	20	Low word
Diff. Curr. Of L1 at Trip (fundamental)	21	High word
Diff. Curr. Of L2 at Trip (fundamental)	22	ms since fault (-1 = no occurance)
Diff. Curr. Of L2 at Trip (fundamental)	23	Low word
Diff. Curr. Of L2 at Trip (fundamental)	24	High word
Diff. Curr. Of L3 at Trip (fundamental)	25	ms since fault (-1 = no occurance)
Diff. Curr. Of L3 at Trip (fundamental)	26	Low word
Diff. Curr. Of L3 at Trip (fundamental)	27	High word
Restr. Curr. Of L1 at Trip (average DC)	28	ms since fault (-1 = no occurance)
Restr. Curr. Of L1 at Trip (average DC)	29	Low word
Restr. Curr. Of L1 at Trip (average DC)	30	High word
Restr. Curr. Of L2 at Trip (average DC)	31	ms since fault (-1 = no occurance)
Restr. Curr. Of L2 at Trip (average DC)	32	Low word
Restr. Curr. Of L2 at Trip (average DC)	33	High word
Restr. Curr. Of L3 at Trip (average DC)	34	ms since fault (-1 = no occurance)
Restr. Curr. Of L3 at Trip (average DC)	35	Low word

Real-Time Device Data Stored in PLC (7UT513) (Continued)

Function	Register Location in PLC Block [1]	Range or Contents
Restr. Curr. Of L3 at Trip (average DC)	36	High word
Restr. Earth Flt.: Value D at Trip	37	ms since fault (-1 = no occurance)
Restr. Earth Flt.: Value D at Trip	38	Low word
Restr. Earth Flt.: Value D at Trip	39	High word
Restr. Earth Flt.: Value S at Trip	40	ms since fault (-1 = no occurance)
Restr. Earth Flt.: Value S at Trip	41	Low word
Restr. Earth Flt.: Value S at Trip	42	High word
Transformer Tank Prot.: Value at Trip	43	ms since fault (-1 = no occurance)
Transformer Tank Prot.: Value at Trip	44	Low word
Transformer Tank Prot.: Value at Trip	45	High word
Fault in the power system	46	ms since fault (-1 = no fault)
General Trip of Device	47	ms since fault (-1 = no occurance)
Trip by thermal overload protection 1	48	ms since fault (-1 = no occurance)
Trip by thermal overload protection 2	49	ms since fault (-1 = no occurance)
Back-up Overcurrent: General Trip	50	ms since fault (-1 = no occurance)
External Trip 1: General Trip	51	ms since fault (-1 = no occurance)
External Trip 2: General Trip	52	ms since fault (-1 = no occurance)
Diff. Prot.: Blocked by harmonics L1	53	ms since fault (-1 = no occurance)
Diff. Prot.: Blocked by harmonics L2	54	ms since fault (-1 = no occurance)
Diff. Prot.: Blocked by harmonics L3	55	ms since fault (-1 = no occurance)
Differential Protection: General Trip	56	ms since fault (-1 = no occurance)
Differential Protection: L1	57	ms since fault (-1 = no occurance)
Differential Protection: L2	58	ms since fault (-1 = no occurance)
Differential Protection: L3	59	ms since fault (-1 = no occurance)
Differential Protection: Trip by Idiff>	60	ms since fault (-1 = no occurance)
Differential Protection: Trip by Idiff>>	61	ms since fault (-1 = no occurance)
Restr. Earth Flt.: General Trip	62	ms since fault (-1 = no occurance)
Transformer Tank Prot.: General Trip	63	ms since fault (-1 = no occurance)
Reserved	64–67	For Future Expansion

1. This register location represents the sequential registers and their numbers within the device itself; as illustrated in **Figure 5.1** in **Chapter 5**, the data register numbers in the Modbus Master and the DTU3005 unit itself will vary from these register numbers.
2. Status information for each parameter is transmitted in two bits. The status bit indicates status (true = 1, false = 0) for the parameter and the valid bit indicates that the device has sucessfully updated the value in the status bit (true = 1, false = 0).

Device Command Data Retrieved From PLC (7UT513)

First Command Word (Command Word)	Additional Command Words (Data or Value)
0 = No command	Unused
1 = Time Sync	2nd Word: Time [ms] - (0-59999) 3rd Word: Time [h/m] - high byte: HH (1-24), low byte: MM (0-59) 4th Word: Date [m/d] - high byte: MM (1-12), low byte: DD (1-31) 5th Word: Date [y] - YY (00-99)
2 = Reset LEDs	Unused
3 = Activate Parameter Set A	Unused
4 = Activate Parameter Set B	Unused
5 = Activate Parameter Set C	Unused
6 = Activate Parameter Set D	Unused
10 = General Command	2nd Word: [Typ] in high byte, [Inf] in low byte

F Diagnostic Data Format

When users select Diagnostic Information to be written to the PLC, 6 registers will automatically be updated in the PLC with the diagnostic information. The location of this block of 6 consecutive registers in the PLC is specified by the user.

The format of this register block follows:

Table F.1 Diagnostics Register Block Format

Offset in Register Block	Register Contents
0	Device communication status for devices 1—16, 1 bit per device Bit 0: Set if Device 1 is not communicating Bit 1: Set if Device 2 is not communicating ... Bit 14: Set if Device 15 is not communicating Bit 15: Set if Device 16 is not communicating
1	Device communication status for devices 17—32, 1 bit per device Bit 0: Set if Device 17 is not communicating Bit 1: Set if Device 18 is not communicating ... Bit 14: Set if Device 31 is not communicating Bit 15: Set if Device 32 is not communicating
2	Count of “no responses” from ACCESS devices (low order word)
3	Count of “no responses” from ACCESS devices (high order word)
4	Count of responses received from ACCESS devices in which data transmission errors occurred (low order word)
5	Count of responses received from ACCESS devices in which data transmission errors occurred (high order word)

G Warranty

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Appendix G: Warranty

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